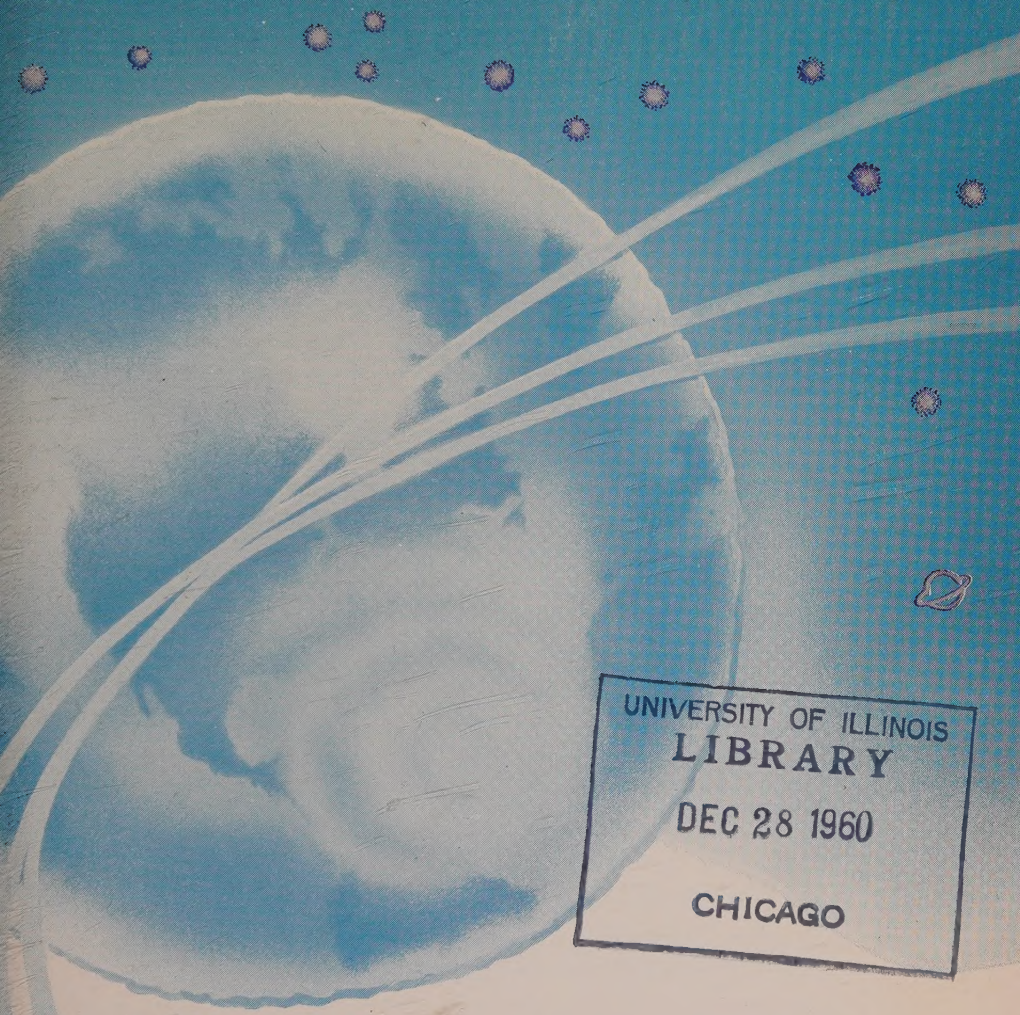
MERICAN METEOROLOGICAL SOCIETY



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Meteorological & Geoastrophysical ABSTRACTS

Vol. 11 JUNE 1960 No. 6

METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

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METEOROLOGICAL AND GEOASTROPHYSICAL ABSTRACTS

MALCOLM RIGBY, Editor

Vol. 11 JUNE 1960 No. 6

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1919

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Special Feature in This Issue

Bibliography on Ionosphere
By
Geza Thuronyi

(*For table of contents see back cover*)

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FOREWORD

Meteorological and Geoastrophysical Abstracts is a monthly publication whose purpose is to bring to the attention of meteorologists, geophysicists and astrophysicists current literature in their field.

Part I contains abstracts of current literature in the fields of meteorology, etc.

Part II of each issue comprises an annotated bibliography of important references on a special subject (usually arranged chronologically).

Bibliographies published in the successive issues were:

Vol. I, 1950

1. Atmos. Pollution 2. Aerobiology 3. Cloud Physics 4. Hail
5. Tornadoes 6. Volcanic Dust 7. Climat. Changes 8. Thunderstorms
9. Icing 10. Acoust. Propagation 11. Evaporation

Vol. II, 1951

1. Extended Forecast. 2. Long Range Forecast. 3. Soil Temp. 4. Constants, etc.
5. Clim. of Near East 6. Clim. of Middle East 7. Special Winds 8. Radar Storm
9. Condensation Trails 10. Clim. of N. E. Africa 11. Mountain Met. Detect.

Vol. III, 1952

1. Clim. of N. W. Africa 2. Carbon Dioxide 3. Clim. of Argentina, etc. 4. Dew
5. Objective Forecast. 6. Stratus Forecast. 7. Urban Climatology 8. Clim. of C. Africa
9. Visibility 10. Glaze and Rime 11. Free Air Turbulence

Vol. IV, 1953

1. Turbulence Theory 2. Turbulent Diffusion 3. Frost 4. Clim. of Australia, etc.
5. High Level Winds 6. Winds in Stratosphere 7. Jet Stream 8. Radiation Bioclim.
9. Clim. of Pacific 10. Auroras 11. Sferics

Vol. V. 1954

1. Oceanog. Met. 2. Clim. of S. E. Asia 3. Auroral Physics 4. Tropopause
5. Balloons 6. Numerical Forecast. 7. Radiation Data 8. Vertical Motion
9. Clim. of Arctic 10. Industrial Met. 11. Wind Waves and Swell

Vol. VI, 1955

1. Bibliog. of Bibliog. 2. Texts & Monogr. Bibliogs. 3. Storm Surges
4. Ionospheric Prop. 5. Photochem.—Upper Atmos. 6. Cloud Physics
7. Radar Cloud Physics 8–9. Atmos. Nuclei 10. Weather Modification 11. Cooling Power

Vol. VII, 1956

1. Synoptic Met.-Arctic 2. Clim. of Enclosed Spaces 3. Cosmic Rays (–1952)
4. Cosmic Rays (1953–56) 5. Atmos. Radioactivity 6. Inversions
7. Snow Micromet. 8. Snow Micromet. (Suppl.) 9–11. Tropical Cyclones

Vol. VIII, 1957

1. Solar Weather Relations 2. Night Airglow 3. Forecasting Special Elements
4. Forest Micrometeorology 5. Hydromet. Forecasting 6. Numerical Forecast. (Suppl.)
7. Albedo 8. Meteors 9–10. Tropospheric Prop. 11. Medical Meteorology

Vol. IX, 1958

1. Radioastronomy 2. Solar Astrophysics 3. Radioactivity in Atmosphere
4. Waves and Currents 5. Physical Oceanog. 6. Dynamic & Phys. Oceanog.
7. Long Range Forecast. 8. Radar Met. 9. Cosmic Rays 10–11. Geomagnetism

Vol. X, 1959

1. Works of C. E. P. Brooks 2. Tornado Forecasting 3. Soil Moisture 4. Sferics
5–6. Ozone 7. Acoustic Waves 8. Evaporation Measurement
9. Evapotranspiration (–1955) 10. Evapotranspiration (1956–1959) 11. Evaporation

Vol. XI, 1960

1. Outstanding Reference Works 2. Outstanding Texts 3. Numerical Forecast. (Suppl.)
4. Ionospheric Physics 5. Ionospheric Propagation 6. Ionosphere

Other bibliographies in preparation are:

Airglow *Forecast Verification* *Radar Meteorology*
Aurora *High Atmosphere Temperatures* *Rocket Meteorology*

Part III contains a listing of reviews, translations, reprints, and the contents of important publications. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. The December issue comprises cumulative author, subject, geographical and journal indexes.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where th material may be found. The Union List of Serials (Gregory) is the source of most of th symbols used. In some cases, where no symbol has been assigned to a library, one will b devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DNLM:	U. S. National Library of Medicine, Washington, D. C.
DSI:	Smithsonian Institution, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts
Ⓢ	after an abstract indicates an abstract prepared for NASA.

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwis stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet using a modifica tion of the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months ar abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Numbe (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus a entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vo 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL AND GEOASTROPHYSICAL MATERIAL

A. GENERAL

1. MAJOR WORKS—TEXTBOOKS

See also: **Wind power utilization** (Kolodin), 11.6–70; **Wind machines** (Shevko), 11.6–71; **Planetary nebulae temps.** (Andriliat), 11.6–77; **Excitation of auroras** (Omholt), 11.6–120; **Radio astron. texts** (Shklovskiĭ), 11.6–140, 11.6–141; **Radio astron. texts** (Iwanowska), 11.6–142; **Geodetic refraction** (Levallois), 11.6–157; **Wind effects on sea levels** (Weenink), 11.6–188; **Tide forecasting** (Sager), 11.6–189; **Hydrology textbooks** (Andreianov), 11.6–193; **Geomorphology and Quaternary hist., Lublin Plateau** (Jahn), 11.6–351.

11.6–1 523.03(02)

*Gamow, George (*Univ. of Colorado*), **Matter, earth, and sky.** Englewood Cliffs, N. J., rentice-Hall, **1958.** 593 p. numerous figs. and photos, tables. **DLC** (QC171.G3). Review ı *Science*, Wash., D. C., 128(3324):587, Sept. 12, **1958.**—A modern, readable and well illus- ated text covering: 1) classical physics, 2) the microcosm and 3) the macrocosm. Individual apters deal with matter and energy, mechanics, wave motions, heat, electromagnetism, light nvisible and visible), space, time and motion, in Pt. I on matter and energy. Pt. II, on the icrocosm, goes into molecules, chemistry, electricity, atoms and nuclear physics. Pt. III, n the macrocosm, takes up the solid earth, sediments and paleo-history, sea and air, planetary stem, sun, stars and stellar systems, relativity and cosmology, and the future of science. h. 17, entitled **Ocean of water and ocean of air,** gives a graphic treatment of ocean currents, aves, the upper atmosphere, ionosphere, auroras, winds, general circulation, fronts, cyclones, noptic charts and forecasting. Other chapters are equally imaginative and up-to-the minute. *ubject Headings:* **1. Cosmic physics textbooks 2. Astrophysics textbooks.**—*M.R.*

11.6–2 57(26)(08)

†Symposium on Perspectives in Marine Biology, Scripps Institution of Oceanography, larch 1956, **Perspectives in marine biology,** ed. by A. A. Buzzati-Traverso. Berkeley, Univ. f Calif. Press, **1958.** 621 p. figs., tables, bibliogs. throughout. **DLC** (QH91.S8 1956). eview by G. F. Humphrey in *Australian Journal of Science*, Sydney, 21(8):268, May **1959.** eview by Howard T. Odum in *Ecology*, Durham, N. C., 49(4):745–746, Oct. **1959.**—This olume contains 46 articles on marine biology presented at a conference held at La Jolla, Calif., larch 24–April 2, 1956 attended by 180 oceanographers or marine biologists from all over the S, Canada, England, Scotland, Denmark, Sweden, Austria, Italy, Mexico, France, Spain and apan, and sponsored by the ONR and Scripps Inst. for the purpose of discussing areas of ivestigation which might be profitably concluded at the expanded facilities of the Scripps ist. at La Jolla. Thirteen papers are presented on Marine Ecology in Pt. I (p. 3–188). An nportant paper by B. G. Bogorov (Acad. of Sci., Inst. of Oceanology, Moscow,) entitled **erspectives in the study of seasonal changes of plankton and of the number of generations t different latitudes** (p. 145–158), goes into diurnal as well as seasonal and latitudinal varia- ons in marine resources from the high Arctic to the tropics, and contains an excellent bibli- graphy. Another good article by A. C. Hardy (Oxford) entitled **Toward prediction in the sea** p. 159–186) with a lengthy discussion, goes into problems of predicting plankton and environ- ental conditions in seas, with examples from the Antarctic (S. Georgia), Singapore Straits, nd North Sea near the British Isles. Methods used in meteorology may be employed, but nce the ocean masses move more slowly than air masses, predictions should be accurate for a nger period ahead. The author's "meteorological-like system of biological recording" by

means of a "continuous plankton recorder" towed across the sea at a standard depth of 10) enables anomalous areas of plankton to be revealed on charts and comparisons to be ma from month-to-month and year-to-year. Thus inflow and outflow of plankton may be record and predicted. "Fronts" of oceanic animals are found on monthly charts, marking edge Atlantic inflow. Weather ships were used to report flow of zooplankton and to make to recordings when going to and from stations in the Atlantic and Arctic. Plankton record lines as of 1953 around British Isles to Iceland, Scandinavia, etc. are shown on a chart. TH project is now under auspices of the Scottish Marine Biol. Assoc. and its home is the Edinburg Oceanographic Laboratory. A "repeating water sampler," a device similar to the planktd recorder, is described and illustrated. It is used for obtaining automatic samples at, sa intervals of 5, 10 or 15 m, and contains 9 large (or possibly 2 dozen smaller) sampling bottl *Subject Headings:* **1. Marine biology symposium 2. Marine ecology 3. Plankton recorde 4. Repeating water samplers. 5. Water mass forecasting. I. Buzzati-Traverso, Adriano (ed.) II. Bogorov, B. G. III. Hardy, A. C.**—*M.R.*

11.6–3 577.4(26)(082.

†Hedgpeth, Joel W. (*ed.*), **Treatise on marine ecology and paleoecology, Vol. 1, Ecolog** *Geological Society of America, Memoir*, No. 67, No. 1, Dec. **1957.** 1296 p. figs., tabl numerous bibliogs. "Prepared under the direction of a Committee of the Div. of Ear Sciences, National Research Council, National Academy of Sciences, Wash., D. C." Pric $12.50. **DLC** (QH542.N3). Review by G. E. R. Deacon in *Nature*, London, 181(4623):155 1560, June 7, **1958.** Review by Ralph W. Dexter in *Ecology*, Durham, N. C., 40(4):744–74 Oct. **1959.**—This monumental work contains 29 separate articles by authorities on vario aspects of oceanography, especially with geology or paleontology (paleoecology), resulting fro a project begun by the Committee on Marine Ecology of the Division of Geology and Geo raphy of the National Academy of Sciences in 1942. Active plans for the Volume began 1946 and nearly 100 specialists assisted. Over 20 of the articles are abstracted separatel These cover such subjects as **Solar radiation, submarine daylight and photosynthesis** Robert W. Holmes (Ch. 6); **Salinity,** by A. S. Pearse and Gordon Gunter (Ch. 7); **Temperatu** by Gordon Gunter (Ch. 8), etc. Pages 1011–1226 consist of 35 separate annotated biblio raphies, mostly on marine biology. Each chapter also has a long and thorough list of referenc on the particular aspect of marine ecology in question. *Subject Headings:* **1. Marine ecolo compendiums 2. Marine ecology bibliographies. I. National Research Council.**—*M.R.*

11.6–4 628.1:551.509

*†Ackerman, Edward Augustus and Löf, George O. G., **Technology in American wat development.** Baltimore, Pub. for Resources of the Future by Johns Hopkins Press, 195 709 p. 37 figs., 27 plates, 35 tables, refs., p. 667–672. Data sources for maps and graphs a sources for photographs, p. 673–675. Price: $10.00 **DWB** (M79A182te), **DLC** (TD345.A2 Review by Ray K. Linsley in *American Geophysical Union, Transactions*, 41(1):36, Mar **1960.**—The theme of this huge volume is the impact of modern technology on organizatio dealing with water utilization and on the utilization itself, with respect to the coming h century in the U.S. The first chapter, after the introduction, deals with the geographi aspects of water occurrence or supply over the earth, in the U.S., and in separate regions of t U. S. Soil moisture, runoff, flood flow, ground water, precipitation, chemistry and suspend material, organic content, pollution and microbiotic contents are summarized quantitativel In subsequent chapters general uses, increasing demands due to technological advanc population increase, economics, use of sea or saline water, weather modification (p. 356–38 discovery of new ground water deposits, extending uses of existing supplies, administrati and management changes resulting from technological advances, etc. The chapter on weath modification goes into ways of increasing soil moisture, runoff, and percolating water; con tions necessary for seeding, methods of seeding, the advisory committee on weather contr results of experiments; control of floods, hail, lightning, fog; effects of weather modificati on water supply and demand, storage, multiple purpose planning, agricultural practic research, legislation, etc. Data and facts obtained from the final report of the Adviso Committee are cited literally. *Subject Headings:* **1. Water resources development 2. Weath modification effects on water resources. I. Seipp, Conrad.**—*M.R.*

11.6–5 551.511.32:532.5(02)

†Vallentine, H. R. (*Univ. of New South Wales*), **Applied hydrodynamics.** London, Butterworths Scientific Publications, **1959.** 272 p. numerous figs. and eqs., refs. Price: $10.00. **DLC** (TC171.V3)—A technical textbook on hydrodynamics for university students in engineering or mathematics, with emphasis on applications rather than theory. It is based on a lecture course given to senior and graduate students in civil engineering at the University of New South Wales for the 5 yrs before publication. The first chapter deals with ideal or non-viscous flow. Then in Ch. 2 the difference between real and ideal flow and methods of analysis are discussed, and cases where classical hydrodynamics can be applied, such as to turbulent flow, are specified. Ch. 3 takes up graphical and numerical analysis and experimental analogies (such as the electrical analogy). Ch. 4 discusses the standard or uniform flow patterns, sources and sinks, vortex pairs, spiral flow, flow past various types of bodies, etc. Ch. 5 and 6 deal with conformal transformation, and Ch. 7 with 3 dimensional, irrotational flow; continuity equations in various types of coordinates, axisymmetric flow, sources, doublets, line sources and numerical analysis. Various theorems are condensed in the 3 appendices. Numerous examples and their solutions and problems without solutions are appended to each section. *Subject Headings:* **1. Applied hydrodynamics textbooks 2. Hydrodynamics textbooks.**—*M.R.*

11.6–6 551.577.2(436.14) 551.552(436.14) 551.510.42(436.14)

*†Steinhauser, F.; Eckel, O. and Sauberer,F. (*all Zentralanstalt Meteorologie und Geodynamik*), **Klima und Bioklima von Wien, III Teil.** [Climate and bioclimate of Vienna, Pt. 3.] Vienna, Österreichische Gesellschaft für Meteorologie, **1959.** 136 p. 26 figs., 37 tables, 7 charts (fold.), Supplement No. 7 to *Wetter und Leben*, Vol. 11, **1959**). (For Pt. 1, *see* 6.11–17 and for Pt. 2, *see* 9.1–30, *Met. Abstracts.*) **DLC**—The contents of Pt. III of the comprehensive survey of the climate and bioclimate of Vienna and its environs include the following, viz: the precipitation distribution in Vienna and its environs, including precipitation amounts, precipitation days and snow conditions; wind conditions in Vienna including influence of topographic conditions, wind data at individual stations; wind distribution in the environs of Vienna; simultaneous wind conditions at different stations and maximum wind velocities; atmospheric pollution including particulate and gaseous pollution, distribution of sulfur dioxide content of the atmosphere, the carbon dioxide content of the air in Vienna, carbon monoxide in city air, ozone content of the air in Vienna, distribution dust of deposits, influence of atmospheric pollution on radiation conditions, radioactivity of the atmosphere, germ content of the atmosphere, and distribution of moss on tree trunks and the street climate of Vienna. Extensive data are presented in tables and graphs. *Subject Headings.* **1. Precipitation distribution 2. Wind regime 3. Atmospheric pollution 4. Vienna, Austria.**—*I.L.D.*

11.6–7 551.5(26)(02)

*Vilaplana Soler, Ricardo (*Spanish Merchant Marine*), **Meteorología nautica.** [Nautical meteorology.] Barcelona, Editorial Juventud, **1958.** 224 p. 33 figs., tables. **DWB** (M:551.46 V696me)—An elementary textbook on marine meteorology with chapters on: 1) general and historical meteorology; 2) moisture; 3) wind; 4) winds and cyclonic storms, hurricanes; 5) waves, currents, ice; 6) meteorological services and information; 7) clouds; 8) fog and visibility—rain; 9) optical and electrical phenomena. Useful tables are appended. The latest information on International Meteorology Codes and on the WMO is incorporated. A few graphs and schematic diagrams and synoptic charts are used for illustration. *Subject Headings:* **1. Marine meteorology textbooks 2. Spanish language.**—*M.R.*

11.6–8 551.5(92) 551.501.81

Watson-Watt, Sir Robert Alexander, **Three steps to victory: a personal account by radar's greatest pioneer.** London, Odhams Press, Ltd., **1957.** 480 p. photos. **DLC** (UG610.W3). Review by R. L. Smith-Rose in *Nature*, London, 182(4633):415–416, Aug. 16, **1958.** Review in the *Institution of Electrical Engineers, Journal*, 4(44):464, Aug. **1958.** Review in *Royal Meteorological Society, Quarterly Journal*, 84(362):481, Oct. **1958.**—Although Sir Robert Watson-Watt is noted mainly for his developmental work in radar, he had considerable interest in meteorology and during much of his life he was directly connected with meteoro-

logical work with the British Meteorological Office as can be gathered from several of the chapters in this autobiographical work. He was invited by SIR WILLIAM NAPIER SHAW come to work in the Meteorological Office in 1915 during World War I, where he gave thund storm warnings to aviators at the Royal Aircraft Factory, under J. S. DINES (son of W. DINES) and with C. J. P. CAVE. Here he worked on atmospherics and sent up pilot balloo He worked on atmospherics (thunderstorm investigations) for the next 20 yrs., which culminat in studies to determine the usefulness of sferics in forecasting storms (1928–31) and lightni research at the Radio Research Station and later at the National Physical Laboratory—H work falling half-way between the theoretical and applied, between the exact and the imperfe He emphasizes the philosophy he propounded of the "Cult of the Imperfect," i.e., "Give the the third best to go on with; the second best comes too late, the best never comes," but not t "fourth best" or in other words the .1% accuracy is too difficult to achieve in an area where 10 tolerances prevail, though great benefits would undoubtedly derive from a 2½% accura The actual development of radar, which is the concern of most of the book, was a natu outgrowth of the WATT'S continuous recording sferics direction recorder, 1918–1921, whi rotated in the same way the World War II radar did. Later these recorders were installed over the British Isles, and in Egypt and India by the end of 1925. He mentions the conserv tive policy of SIR GEORGE SIMPSON toward research—he turned down WATT'S request for fun for radio-meteorological research and at the same time boasted of having a £2000 fund research which he "hadn't had to use," so was more zealous than the crown in saving t treasury's money. He later assured WATT that he had done him a favor by steering him c of the Meteorological Office (into the D.S.I.R.). *Subject Headings:* **1. Biography of Sir Robo Alexander Watson-Watt 2. Watson-Watt, Sir Robert A. 3. Sferics research 4. Thund storm surveys 5. British Meteorological Office 6. Radar development. I. Sha Sir W. N.**—*M.R.*

11.6–9 52(C

†Koestler, Arthur, **The sleepwalkers: a histroy of man's changing vision of the Univers** Introd. by Herbert Butterfield. London Hutchinson, **1959.** 624 p. figs. Bibliograph refs. by ch., p. 547–610. Bibliog., p. 611–613. **DLC** (BL245.K63). Review by E. G. Taylor in *Institute of Navigation, London, Journal*, 12(3/4):260–265, July/Oct. **1959.**— eminently readable account of the history of astronomy, astronomical theories, observatio equipment and ideas of the universe, mainly centered around the lives of great natural phil ophers or scientists such as Pythagoras, Aristotle, Ptolemy, Copernicus, Kepler, Tycho Brahe, Galileo and others, but slanted toward the psychological aspects, both of the lives these geniuses, and of the thinking of the age in which they lived. The fact that many negati aspects of the characters involved have not been revealed hitherto is evident throughout t book, but this is not intended to detract from their greatness but to add to our understandi *Subject Heading:* **1. History of astronomy.**—*M.R.* ©

2. POPULAR SCIENCE BOOKS

11.6–10 551.582.2(9

*Rusin, Nikolaĭ Petrovich, **Klimat Antarktidy.** [Antarctic climate.] Leningrad, Gidrom Izdat., **1959.** 111 p. 31 figs., 20 tables. **DLC** (QC994.9.R8)—A semi-technical bulle on the Antarctic climate and weather based on the latest data of IGY, etc. The gene character of the Antarctic continent, climatic influences, general climatic characteristics, t condition in winter, spring, summer and autumn, respectively; local climate of the Antarc "Oasis," and the past climates and glaciation of the Antarctic are reviewed. Many illust tions and tables of mean monthly and mean and extreme annual temp. (11 stations), wi speed (10 stations), max. wind, days with gales (340 at Cape Dennison) are included. T text, graphs and tables are analytical rather than purely descriptive, and great emphasis placed on the radiation balance, not only of the Continent as a whole but the special situat of the "Oasis." *Subject Headings:* **1. Climate of Antarctica 2. Radiation balance of Antarct 3. Antarctic Oasis 4. Antarctica.**—*M.R.*

11.6–11 91.04(98)

Badigin, Konstantin Sergeevich, **Tri zimovki vo l'dakh Arktiki.** [Three winters in the Arctic ice.] Ed. by N. N. Zubov. Moscow, Izdatvo tsk Vlksm "Molodaia Gvardiia," 1950. 342 p. figs., photos, maps. Glossary, p. 520–539. **DLC** (G630.R8B33)—Capt. K. S. Badigin spent 812 days (1937–40) in the Arctic ice as commander of the "Georgii Sedov" expedition, and for his success and scientific achievements he was awarded the Order of Lenin and named a hero of the Soviet Union. This account, edited by the famous authority on Arctic ice and oceanography, N. N. Zubov, gives in full detail the navigation, equipment, life and scientific work of the expedition, which reached to within 370 km of the pole, or to 86°40'N at 48°E (Aug. 29, 1939). *Subject Headings:* **1. "Sedov" Drifting Expedition, 1937–1940 2. Arctic drift expeditions. 3. Arctic.**—*M.R.*

11.6–12 551.507.2:614.86:627.95

Floherty, John J., **Search and rescue at sea.** Phil., J. B. Lippincott, **1953.** 150 p. photos. **DWB** (614.86 F629s)—A popular report on rescue operations performed by planes and ships of the U. S. Coast Guard. There are picturesque descriptions of riding out a hurricane on weather ship "Pontchartrain," of the Arctic exploits of the Coast Guard cutter "Bear," and on life and work on a weather ship and the rescue of plane passengers by a weather ship. *Subject Headings:* **1. Weather ships 2. U. S. Coast Guard 3. Marine rescue operations.**—*A.A.*

11.6–13 551.46(261/267)(023)

Pettersson, Hans, **Westward ho with the Albatross.** London, Macmillan and Co. Ltd., **1954.** 205 p. figs. **DLC** (Q115.S95P44)—A popular account of the author's experiences on the globe circling Swedish Deep Sea Expedition of the "Albatross," 1947–48, when oceanographic soundings were made as near to the equator as possible in the Atlantic, Pacific and Indian Oceans. A number of ocean islands were visited, but the main purpose was to get the feel of the ocean's bottom at great depths; the deposits, their reactions with the ocean water and the thickness of the sediments. Soundings were made both by echo and by cable, depth explosions, ultrasonic waves, etc. Photos show corers in operation, bathythermograph and radiation samples as well as biological specimens, geological cross sections showing climatic periods, etc. *Subject Headings:* **1. "Albatross" (Swedish Deep Sea) Expedition 1947–1948 2. Oceanographic expeditions 3. Atlantic Ocean 4. Pacific Ocean 5. Indian Ocean.**—*M.R.*

11.6–14 550.38(09)

Pochtarev, V. I., **Zemlia bol'shoĭ magnit.** [The world is a large magnet.] Leningrad, Gidrometeoizdat.-Izdatel'stov, **1958.** 85 p. 18 figs., 2 tables.—A pamphlet giving: 1) a historical sketch on study of the earth's magnetic field; 2) its application in navigation, geological surveying, ionospheric and radio propagation, investigations, military application, etc.; 3) a chapter on scientific studies, networks or surveys on land and at sea and in the air, and in IGY, 1957–8; and 4) the probable causes of the earth's magnetism and its variation. *Subject Headings:* **1. Geomagnetism 2. History of geomagnetism.**—*M.R.*

11.6–15 551.593(023)

Shifrina, E. M. and Anadreev, Iu. N., **Vozdushnoe zerkalo.** [The aerial mirror.]—Leningrad, Gidrometeoizdat, **1949.** 61 p. 27 figs. **DWB**—A popular scientific pamphlet (10,000 copies) on various optical phenomena in the atmosphere: mirages, atmospheric refraction, rainbows, halos, mock suns, Brocken spectres, sunset or sunrise phenomena associated with reflection, refraction, diffraction, etc. of light in the atmosphere. The geometric principles are illustrated schematically but nonmathematically. A number of standard photographic illustrations are included. *Subject Heading:* **1. Optical phenomena.**—*M.R.*

11.6–16 551.582.1(510)

Wang, Chün-hêng, **Simple geography of China.** Peking, Foreign Languages Press, **1958.** 256 p. numerous photos and maps. Index of place names. (*China Knowledge Series*) **DLC** (DS711.W27). Review by Herold J. Wiens in *Geographical Review,* 50(1):131–132, Jan. **1960.**—In this small book on modern China (general geography and regional geography),

a chapter on climate (p. 22–34) gives maps and discussion of Jan. and July temperature seasons, precipitation, pressure and winds, effect of surface features, monsoons and typhoons and effect of climate on economy. In other chapters weather and climate are discussed especially in the regional sections, which are all well illustrated. *Subject Headings:* **1. Climat of China 2. China.**—*M.R.*

3. IGY—ARCTIC—ANTARCTIC

See also: **Marine biol. conf.**, 6.11–2; **Climate, Antarctica** (Rusin), 11.6–10; **"Sedov" Drifting Exped., 1937–1940** (Badigin), 11.6–11; **Arctic sea ice conf.**, 11.6–25; **IGY solar program** (Kopecky), 11.6–84; **IGY solar data** (Müller), 11.6–86; **Airglow obs. during IGY** (Kvifte), 11.6–127; **IGY geomag. program** (Yoshimatsu), 11.6–138; **IGY stations**, 11.6–236; **Altitude determination, Charcot station** (Gilbert et al.), 11.6–303.

11.6–17 550.3(08) 550.3:061.3(08

International Geophysical Year, 1957/1958. U. S. National Committee, **Geophysics and the IGY: proceedings of the Symposium at the opening of the International Geophysical Year, National Academy of Sciences, Wash., D. C., June 28–29, 1957.** Ed. by Hugh Odishaw and Stanley Ruttenberg. *American Geophysical Union, Geophysical Monograph*, No. 2, **1958** 210 p. figs., bibliogs. *National Academy of Sciences—National Research Council, Publication* No. 590. (For listing of contents, *see* Pt. III, p.1455, Nov., 1958, *Met. Abstracts*. All articles abstracted separately.) **DLC** (QC801.3.U42). Review by A. A. Day in *Australian Journal of Science*, 21(7):228, March/April **1959.** Review by D. Taylor Smith in *Nature*, 182(4644) 1187, Nov. 1, **1958.** Review by S. N. Mitra in *Indian Journal of Meteorology and Geophysics*, Delhi, 10(3):366–367, July **1959.** Review by Earl G. Droessler in *American Meteorological Society, Bulletin*, 40(11):583, Nov. **1959.**—This volume presents a group of papers, on a wide variety of topics on geophysics, delivered at a "special symposium, June 28 and 29, 1957 conducted by the U. S. National Committee for the International Geophysical Year just before the IGY program formally began." The papers are not only of general and historical interest but many of them contain reports on early results of the IGY. "Certain geophysical research which formed the basis for the IGY departure is also incompassed in this volume." The papers not only provide information on the status of projects initiated just before the IGY began but often present reviews of the general status of a discipline. The general subjects covered include upper atmospheric physics, the lower atmosphere and the earth, and the polar regions. *Subject Headings:* **1. Geophysics symposia 2. IGY symposium. I. Odishaw, Hugh** (*ed.*) **II. Ruttenberg, Stanley** (*ed.*).—*I.L.D.*

11.6–18 551.501.9:551.506.22(99)

Barnier, L., **Images polaires de l'année géophysique.** [Polar pictures of the Geophysical Year.] *Geographia*, Paris, No. 87:25–40, Dec. **1958.** 18 photos. **DLC, NN, NIC**—Account of the work and scientific program carried out by different countries in the Antarctic for the International Geophysical Year. Survey of the different scientific investigations carried out in the Antarctic. Several photos illustrate this work. *Subject Heading:* **1. IGY Antarctic program.**—*A.V.*

11.6–19 551.5:550.3:061.1 551.506.22

United Nations Review, N. Y., **Our unknown planet: the World Meteorological Organization and the International Geophysical Year.** Reprint of 16 p. from the *United Nations Review*, Feb. **1957.** photos. **DLC** (QC801.3.U35)—A popular, illustrated outline of the overall nature and function of the IGY program of activities, with particular emphasis on the role played by meteorology. The problems and objectives of each of the 10 related areas of IGY research—World Days, geomagnetism, aurora and airglow, ionosphere, solar activity, cosmic radiation, longitudes and latitudes, glaciology and climatic variation, oceanography and rockets—are summarized and the importance of on-the-spot observation and international cooperation is stressed in this world wide attempt to understand "our unknown planet." *Subject Headings* **1. IGY research 2. Popular meteorology.**—*R.P.*

11.6–20 551.5(99) 551.506.22

Wexler, Harry (*U. S.-I. G. Y. Antarctic Prog., Natl. Acad. of Sci.*), **IGY meteorology in Antarctica.** *Weatherwise*, Boston, 11(4):114–115, Aug. **1958.** fig. **DWB**—The history of U. S. meteorological observations in Antarctica since 1911 is briefly reviewed, and the IGY program, stations and personnel are mentioned and shown on a chart. *Subject Headings:* **1. U. S. Antarctic meteorological observations 2. IGY Antarctic meteorological program.**—*M.R.*

11.6–21 551.506.22:551.510.535:551.594.6

Helliwell, Robert A. (*Stanford Univ. Dept. of Electr. Eng.*), **Upper atmosphere.** *American Museum of Natural History, N. Y. Hayden Planetarium, Contributions, Ser.* 1, No. 1:24–28, **1958.** 6 figs. **DWB** (551 A512co)—Review of ionosphere program of IGY with schematic cross sections and diagrams of upper atmospheric structure, radio propagation experiments and especially whistler research. *Subject Headings:* **1. IGY ionosphere program 2. Whistler research.**—*M.R.*

11.6–22 550.3:551.506.22(47)

U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoĭ Sluzhby. Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, **Informatsionnyĭ Sbornik.** [Compilation of information]. No. 4, **1957.** 115 p. figs., photos, tables. (For listing of contents, *see* Pt. III, p. 1475, Nov. 1958, *Met. Abstracts.* All articles abstracted separately.)—On p. 3–19 of this first Information release, the scientific work on problems of the IGY as fulfilled by the principal administrations of the Soviet Hydrometeorological Service, is discussed. The Principal Directorate of the Hydrometeorological Service is engaged in the following investigations in connection with the IGY: the study of the general circulation and three dimensional analysis of the atmosphere over large areas; the dynamics of the atmosphere at the equator and exchange of air between the Northern and Southern Hemispheres; the relationship between geophysical phenomena in the troposphere and the lower stratosphere; heat balance of the surface of the earth in relation to the general atmospheric circulation; atmospheric turbulence; atmospheric ozone in relation to the general circulation and weather; properties of oceanic waves; the Atlantic polar front and oscillations of the sea levels. A brief summary of these investigations is presented and the various institutes and branches of the Hydrometeorological Service investigating particular problems are listed. The Central Institute of Forecasting investigates the following subjects: atmospheric currents, in particular jet streams in the Northern Hemisphere; relationship of thermal conditions to the Azores High in the Equatorial Atlantic; aerological and synoptic conditions in Antarctica; study of cyclonic activity over seas and oceans with the aid of microseismic observations; construction of mean monthly charts of pressure, temperature and geopotential for the entire earth; the characteristics of circulation at low latitudes with special reference to weather forecasting by hydrodynamic methods; interaction of the atmosphere of the Southern and Northern Hemispheres; and hydrodynamic theory of monsoon circulation. The A. I. Voeĭkov Principal Geophysical Observatory studies the following problems: heliogeophysical relationships and their use in studying the secular variations of climate and variations of weather regimes of individual years and months; principles of snow cover formation in Antarctica; the temperature-wind fields at the tropopause and in the lower stratosphere in the high latitudes of the Northern Hemisphere; nuclei of condensation in the atmosphere; absorption and radiation of infrared rays in the atmosphere; radiation balance of the atmosphere near the ground and of other atmospheric layers; anomalies of the basic meteorological elements in the Northern and Southern Hemispheres and their interaction; pressure, temperature and precipitation normals for the Southern Hemisphere; distribution of solar radiation over the earth; heat and moisture transport processes between the Northern and Southern Hemispheres; heat balance of the North Atlantic (with the State Oceanographic Institute); atmospheric ozone (with the Central Aerological Observatory and Kazakh Hydrometeorological Institute); and the boundary layer of the atmosphere in the Central Arctic. The Central Aerological Observatory is engaged in the following studies: characteristics of the meridional profile of meteorological parameters according to observations along meridians 30, 75, 110 and 140°E. long.; aerological and synoptic characteristics of Antarctica; aerological properties of the lower kilometer of the atmosphere especially wind

flow in the vicinity of Mirny observatory on the basis of airplane and radiosonde data; a structure and evolution of cyclones and atmospheric fronts in the Central Arctic. The St Institute of Oceanography investigates the following subjects: hydrology of the North Atlan Ocean; temperature regime of the North Sea; effect of atmospheric processes on the formati of large thermal anomalies in the surface layer of the water in the northwest Pacific Ocean a in adjacent seas; methods of computing wind currents in the North Atlantic; principal featu of the hydrology of the Indian Ocean and basic facts on the hydrology of the Atlantic Oce *Subject Headings:* **1. IGY hydrometeorological program 2. Soviet participation in IGY IGY meteorological program 4. IGY geophysical program 5. U.S.S.R.**—*I.L.D.*

4. CONFERENCES AND SYMPOSIA

11.6–23 551.515.2:377

Caribbean Hurricane Seminar, Ciudad Trujillo, Dominican Republic, Feb. 16–25, 19 **Final Report of the Seminar held under the joint auspices of the government of the Dominic Republic, the U. N. Technical Assistance Administration and the World Meteorologi Organization.** Ciudad Trujillo, Pub. by the Govt. of the Dominican Republic, the UNT and the WMO, **1956.** 401 p. figs., photos, tables. (For listing of contents, *see* Pt. II p. 630, April 1959, *Met. Abstracts.* These articles abstracted separately.) **DWB.** Span translation issued Ciudad Trujillo, **1957,** with title, **Seminario sobre los huracanes del Cari . . .** 409 p. **DLC** (QC945.C32 1956) Review by C. S. Ramage in *American Meteorologi Society, Bulletin,* 40(11):581–582, Nov. **1959.**—The papers presented at the Seminar are ranged into five sections: A.—Opening addresses; B.—Structure, formation and dynamics hurricanes; C.—Observations, analysis and forecasting; D.—Research; E.—Hurricane effe and precautionary measures. Some of the papers were notably well arranged and lucid presented. However, the Report is full of misprints and many diagrams are illegible. *Subj Headings:* **1. Hurricane seminars 2. Caribbean. I. World Meteorological Organizati Regional Association IV. Eastern Caribbean Hurricane Committee II. Dominican Republ (Government) III. United Nations Technical Assistance Administration IV. Huer Fernando** *(ed.)*—*From review by C. S. Ramage.*

11.6–24 551.574.1:551.509.6:06

Simposio Internazionale sulla Fisica delle Nubi e Relative Applicazioni all'Agricoltu Asti, Italy, April 27–28, 1958, **Atti** [Proceedings of the International Symposium on Clo Physics and the Applications to Agriculture]. Issued Asti, Centro per lo Sviluppo de Difesa Antigrandine della Provincia di Asti, Dec. **1958.** 143 p. figs., tables, refs. (Pertine articles abstracted separately.)—Review of the communications presented at the Symposi held at Asti (Italy) on April 27–28, 1958 on cloud physics and the applications to agricultu The conference was attended by experts from most of the European countries. Among t principal subjects treated were: cloud seeding, icing nuclei, hail prevention, dynamics of thu derstorm clouds and cold air invasions. *Subject Headings:* **1. Cloud physics conferenc 2. Hail prevention.**—*A. V.*

11.6–25 551.326.7(268):06

*†Arctic Sea Ice Conference, Easton, Maryland, Feb. 24–27, 1958, **Proceedings.** Support by the Office of Naval Research. *National Research Council, Wash., D. C., Publication,* N 598, Dec. **1958.** 271 p. tables, figs., refs. (For listing of contents, *see* Pt. III, p. 17 Nov. 1959, *Met. Abstracts.* All articles abstracted separately.) **DLC, DWB** (551.311 A675p —The Division of Earth Sciences of the National Academy of Sciences, National Resear Council, organized and conducted the Arctic Sea Ice Conference at the request of the Geograp Branch, Office of Naval Research. The scope and objectives of the meeting were determin in consultations with O.N.R. specialists and other Navy scientists who amplified the init request. A planning committee was formed by the Division to outline the program. T conference was held from Feb. 24–28 at Easton, Md. The six daytime sessions covered t following: 1) Distribution and character of sea ice; 2) Sea ice observing and reporting tec niques; 3) Physics and mechanics of sea ice; 4) Sea ice formation, growth and disintegratio 5) Drift and deformation of sea ice; 6) Sea ice prediction techniques. In addition, eveni

sessions were held on other aspects of sea ice problems. The participants were from different countries and included a good sized Russian delegation. Proceedings of the conference, reprints of the 28 papers read and discussions thereon are included. *Subject Headings:* **1. Arctic sea ice conferences 2. Arctic. I. U. S. Office of Naval Research II. National Research Council, Washington, D. C.**—*I.S.*

11.6–26 551.510.42:061.3

*National Conference on Air Pollution, Wash., D. C., Nov. 18–20, 1958, **Proceedings.** *U. S. Public Health Service, Publication*, No. 654, **1959.** 526 p. tables. (Pertinent articles abstracted separately). **DWB** (M10.42 N277pr). Also: U. S. Public Health Service, **Highlights, National Conference on Air Pollution 1958.** Its *Publication*, No. 648, **1959.** 42 p. ports. Program, list of delegates, summaries of meetings, speakers, etc. **DNLM**—The 1958 National Conference on Air Pollution was organized to provide opportunity for persons representing a wide variety of interests and discipline, directly or indirectly related to air pollution control, to discuss the current status of knowledge in the field and chart a practicable future course of action. A wealth of material, much of it reported for the first time was presented and discussed during the three-day sessions. Recommendations were made which reflect the diversity of interest represented at the Conference and which should point the way to action by governmental agencies at all levels, by industries and by private institutions and organizations. The present volume of Proceedings is based on the formal presentations made to the plenary and group sessions, plus a stenographic transcript of the discussion group meetings. It has been edited only to the extent that repetition and formalities have been eliminated. It contains all the essential material including the discussion of controversial issues upon which no consensus of opinion was reached. *Subject Heading:* **1. Atmospheric pollution conferences.**—*I.S.*

5. SOCIETIES AND SERVICES

11.6–27 551.579:061.1(476)

Glomozda, A. A., **Gidrometeorologicheskaia sluzhba Belorusskoĭ SSR za 40 let.** [The Hydrometeorological Service of Byelorussian S.S.R. during the past 40 years.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:28–30, Feb. **1959. DWB, DLC**—The history of the founding and development of the Hydrometeorological Service of Byelorussian Republic since the October Revolution is presented. The development of a hydrometeorological service in Byelorussia began with LENIN's decree "On the organization of a hydrometeorological service in the RSFSR," issued in 1921. A Central Directorate of the Hydrometeorological Service of the Byelorussian S.S.R. was organized in 1953. The destruction of the Service during the second world war, the gradual reestablishment of the Service by the Central Directory of Hydrometeorology of the Red Army as early as 1942 and the gradual reestablishment and expansion of the Hydrometeorological Service since the war are summarized. The scope of observations, the services provided to the national economy, and special research activities are discussed. *Subject Headings:* **1. Hydrometeorological services 2. Byelorussian S.S.R.**—*I.L.D.*

11.6–28 551.588.6(251):061.3

Mather, J. R., **American Meteorological Society (Contribution to the AAAS New York Meeting program, Dec. 26–31, 1956, on) meteorological and climatological sciences in grasslands problems.** *Science*, Wash., D. C., 125(3242):293, Feb. 15, **1957. DLC**—As part of a seminar on grasslands (Sec. O.) in our national life, the AMS held a session on relation of meteorology and climatology to grasslands. Five papers were read: J. R. MATHER, E. R. BIEL, J. M. BEALL, L. B. LEOPOLD and C. P. BARNES. These are summarized briefly. *Subject Headings:* **1. Grasslands climatology seminars 2. American Meteorological Society meetings.**—*M.R.*

11.6–29 551.5:061.1

Viaut, A., **WMO and the development of meteorology achievements and future prospects.** *World Meteorological Organization, WMO Bulletin*, 8(1):2–5, Jan. **1959. DWB**—Several

achievements during the past decade which the WMO can justifiably be proud of are enume ated and discussed: establishment of the Technical Regulations, publication of the **Clou Atlas** and **Technical Notes,** improvement of observing networks and communications channe international cooperation in arid zone research, IGY cooperation and creation of Meteorologic Data Center at Geneva, and participation in U. N. Technical Assistance Program. Finall there is the future prospect of IGC (International Geophysical Cooperation) and assumptio of responsibility for hydrological observation and investigation throughout the world. *Subje Heading:* **1. WMO activities.**—*M.R.*

11.6–30 551.5:061.1(7J

Whitnah, Donald R. (*Valley City* (*N. Dakota*), *State Teachers College*), **The United State Weather Bureau: a study in science and politics.** *North Dakota Teacher*, Bismarck, Nort Dakota, 38(3):8–9; 32–34, Nov. **1958.** port. "Summary of Ph.D. thesis in history at th Univ. of Illinois." **DWB**—A knowledgeable review of U. S. Weather Bureau services to th public, aviation, hurricane warning, severe storm and tornado, fire weather, fruit frost an other special services, and a few remarks on the turbulent "political" history of the U. S. W. I in the early years (1870–1915), and recent (1938-date) developments in the service. *Subje Headings:* **1. U. S. Weather Bureau services 2. History of U. S. W. B.**—*M.R.*

6. EDUCATION, HISTORY, BIOGRAPHY AND BIBLIOGRAPHY

Education

11.6–31 551.5(02):3

†Blough, Glenn O.; Schwartz, Julius and Hyggett, Albert, **Elementary school science an how to teach it.** rev. ed. N. Y., Dryden Press, **1958.** 608 p. numerous figs. and photos bibliog., p. 562–591. **DWB** (372.35 B657eL)—Ch. 10A and 10B (p. 187–228) concern the ai and the weather (atmospheric structure, composition, sun, air and water, instruments an observations, moisture, hydrometeorology, wind, air masses, fronts, highs and lows, hurricane tornadoes, thunderstorms, the weather map, forecasting and weather control). Questions fo children studying weather and laboratory experiments, field trips and suggestions for setting u a weather station are included in Ch. 10B. *Subject Heading:* **1. Elementary meteorology text books.**—*M.R.*

11.6–32 551.5:373.5:9

Gerasimova, T. P., **Nabliudeniia nad pogodoĭ v prepodavanii geografii.** [Weather obser vations in teaching geography.] 2d ed. Moscow, Gosud. Uchebno-Pedagog. Izd-vo, **1954** 92 p. figs., tables, foot-refs. **DLC** (QC869.G4 1954)—A small pamphlet giving basic idea on the atmosphere, radiation and heating of atmosphere, pressure, wind, water vapor, weathe and climate for the 5th, 6th and 7th grade (European System) classes in geography. The book is intended mainly as a guide for the teachers rather than the students. Applications in agri culture and industry, commerce, etc. are emphasized. *Subject Headings:* **1. Teaching of meteor ology in secondary schools 2. Meteorology in geography classes.**—*M.R.*

11.6–33 551.5:92(43)

Kobe, Gertrud (*comp.*) (*Humboldt Univ. Berlin*), **Liste der Doktoranden, die bei Heinrich Ficker in der Zeit seiner Tätigkeit an der Berliner Universität (1923–1937) promovierten** [List of doctorate candidates who were qualified by Heinrich Ficker during the period of his activity at Berlin University (1923–1937).] *Zeitschrift für Meteorologie*, Berlin, 12(4/6):100– 101, April/June **1958. DWB, DLC.** *Subject Headings:* **1. Meteorologists 2. Training in meteorology.**

11.6–34 551.5:371.048

Kuhn, Walter, **Meteorologie als Wissenschaft und Beruf.** [Meteorology as a science and a profession.] *Schweizerische Hochschulzeitung*, Zurich, 32(1):19–27, **1959. DLC**—This article is meant for university students and for persons interested in general teaching or voca tional guidance. It explains the classical synoptic forecasting method, some recent problems

. meteorology, such as mathematical forecasting (numerical or graphical) and questions garding physics and instruments. The relationships between meteorology and conservation e also mentioned. The vocational training of meteorologists in Switzerland and abroad, ie appointment and employment conditions, and some professional questions are the subject the last paragraph. *Subject Heading:* **1. Training in meteorology.**—*A. V.*

11.6–35 551.5(04):37

Sheppard, P. A., **Education and research in meteorology in the United Kingdom.** *Royal Meteorological Society, Quarterly Journal*, 85(365):187–195, July **1959. DWB, DLC**—Notes n present state and future prospects for meteorology, including observations on the demand or meteorologists and for meteorology by society, education in meteorology and research, oth deductive and descriptive, conducted—or which should be conducted—in the future. mphasis is on need for a good theory of climate (general circulation and world wide variations ver periods of several days to centuries, divorced from bias forced on such studies by applica- ons to long range forecasting, etc.). *Subject Headings:* **1. Meteorological education 2. Meteorological research, England.**—*M.R.*

History

See also: **Hist. of geomagnetism** (Pochtarev), 11.6–14; **Historic weather records, Linz** (Wacha), **11.6–350.**

11.6–36 551.501.9(468.2)(09)

Hurst, G. W., **A brief history of meteorology in Gibraltar.** *Weather*, London, 14(2):41–48, eb. **1959.** fig., 9 refs. **DWB**—Seasonal rainfall records at Gibraltar date back to 1790 Royal Engineers), but the earliest remaining daily records begin Nov. 17, 1812 and the first ublished records begin in 1821, readings of temp. and humidity were also included in 1852, hen a station was established with a barometer. Responsibility was transferred to the olonial Government on April 1, 1862. From April 1, 1852 records were made at South astion on the central west coast for 67 yrs. Sites of all 17 stations (1790–1958) are shown n a detailed topographic chart. The Air Ministry meteorological personnel took over in 1938 with midnight observations. Since 1948 the only station has been at the airfield. Wind equip- nent, forecast services, airplane soundings, radiosondes, reconnaissance flights, communications nd other local problems are discussed. A list of 16 published papers on meteorology and the limate of Gibraltar are appended. *Subject Headings:* **1. History of Gibraltar meteorological tation 2. Gibraltar meteorological station 3. Gibraltar.**—*M.R.*

11.6–37 91(05)

Shvede, E. E., **K 100-letnemu iubileiu zhurnala "Petermanns Geographische Mitteilungen."** [Hundredth anniversary of Petermanns Geographische Mitteilungen.] *Vsesoiuznoe Geograficheskoe Obshchestvo, Leningrad, Izvestiia*, 89(4):372–376, **1957.** 4 refs. **DLC**—A history of *Petermanns Geographische Mitteilungen* with reference to the writings of Russian geographers hat have appeared in this journal since its founding in 1856, and a comparison of the contents of the first issue with those of the Jubilee issue of 1956. *Subject Heading:* **1. Petermanns Geographische Mitteilungen 2. Geographical journals.**—*I.L.D.*

Biography

See also: **Biog. of Watson-Watt, 11.6–8.**

11.6–38 551.5:92

†Bullard, Edward, **Edmond Halley (1656–1741).** *Endeavour*, London, 15(60):189–199, Oct. **1956.** 5 figs. (incl. photos), 17 refs. **DLC.** Also: Chapman, Sydney, **Edmond Halley, F. R. S., 1656–1742.** Reprinted from *Royal Society of London, Notes and Records*, 12(2):168–174, Dec. **1957.** port. Separated sheets issued as *Alaska. Univ. Geophysical Institute, Contributions, Ser. B*, No. 25, **1958. DWB**—On the occasion of the three hundredth anniversary of HALLEY'S birth, BULLARD reviews his life and scientific career. HALLEY'S contri-

butions included a catalogue of the southern stars, studies on the declination of the magne compass, iterative methods for obtaining the roots of numbers, charts of the Atlantic Oce and of the entire world showing lines of equal declination, study of comets, etc. *Subj Headings:* **1. Biography of Edmond Halley 2. Halley, Edmond.**—*I.L.D.*

11.6–39 551.5:

Hugo Hergesell. Gedenkworte zum 100. Geburtstage, am 29. Mai 1959. [Hu Hergesell: celebration of the 100th anniversary of his birth, May 29, 1959.] *Beiträge z Physik der Atmosphäre*, Frankfurt a.M., 32(1/2):1, **1959. DWB, DLC**—HUGO HERGESEL one of the world renowned pioneers of aerology and international cooperation in aerology an one of the founders of the *Beiträge zur Physik der Freien Atmosphäre* in 1904 (Hergesell-Fes band Vol. 15, 1929 on 70th birthday), died June 6, 1938. *Subject Headings:* **1. Biography Hugo Hergesell 2. Hergesell, Hugo.**—*M.R.*

11.6–40 551.5:9

Jameson, H., **[Obituary of] Dr. A. J. Bamford.** *Meteorological Magazine*, Londo 87(1032): 188–189, June **1958. DWB, DLC**—ALEC JOSCELYNE BAMFORD was in his 73r year when he passed away Nov. 19, 1957, after a short illness. He lived in Ceylon from 190 to 1931 where he was superintendent at Colombo Observatory. Several instruments, method investigations and publications are linked to his name. He received the Military Cross as Captain, and rose to the rank of major. In England he engaged in teaching until he accepte a post in the Meteorological Office which he held from 1941 until he retired in 1946. *Subje Headings:* **1. Biography of A. J. Bamford 2. Bamford, Alec Joscelyne.**—*W.N.*

11.6–41 551.5:9

[Obituary of] Floyd Dillon Young. *American Meteorological Society, Bulletin*, 40(10):52 Oct. **1959. DWB, DLC**—FLOYD D. YOUNG, charter member of the American Meteorologica Society and retired Weather Bureau official, died in Pomona, Calif., on June 15, 1959. Bor Jan. 1891 in Santa Ana, Calif., his Weather Bureau career stretched over 46 yrs. Most of h service was in California in connection with fruit-frost forecasting. *Subject Headings:* **Young, Floyd Dillon 2. Obituary of F. D. Young.**—*I.S.*

BIBLIOGRAPHY

11.6–42 551.510.53:01

†Quiroz, Roderick S., **A survey of upper air climatological information sources.** *U. S Air Weather Service. Climatic Center, Technical Memorandum* 59–4, Sept. **1059.** 57 p. tables, 128 refs. **DWB**—A selective, annotated bibliography of 128 references to climati data for the atmosphere at high altitudes (mainly up to 100,000 ft) taken from files of the Ai Weather Service Climatic Center. Each section contains a critical analysis of the literatur from a climatological viewpoint. The major sections include: 1. heights of pressure surfaces 2. upper air temperatures, 3. upper air winds, 4. moisture, 5, clouds, 6. density, 7. interrelation between the above parameters, 8. general surveys of upper atmosphere. The items are liste in reverse chronological order. Tables give heights of pressure levels, principal series of mea constant pressure charts, isothermal charts and meteorological—statistical relationships Maps, data compilations, variability and other aspects are used as subdivisions of the majo headings. Many bibliographies (e.g., from *Met. Abstracts*) are listed among the other item in proper place. An author index is appended. *Subject Headings:* **1. Upper atmospher bibliographies 2. Upper atmosphere humidity 3. Upper atmosphere temperatures 4. Uppe atmosphere winds.**—*M.R.*

11.6–43 551.5(02):01

†Rigby, Malcolm (*Ed., Meteorological Abstracts*), **Popular and technical books on meteor ology, 1957–58.** *Weatherwise*, Boston 12(2): 73–75, April **1959. DWB**—A popular typ review of 10 general or special books published in the English language in 1957 and 1958, and listing of 11 others with brief notes. *Subject Headings:* **1. Reviews of meteorological literatur 2. Meteorology bibliographies.**—*M.R.*

11.6–44 551.521.1:016

†Stanford Research Institute, Stanford Univ., **Applied solar energy research: a directory of world activities and bibliography of significant literature.** Ed. by Jean Smith Jensen. 2d ed. (Special supplement to **Solar Energy,** the Journal of Solar Energy, Science and Engineering) Pub. by the Association for Applied Solar Energy, Phoenix, Arizona and Stanford Research Institute, Menlo Park, Calif., **1959.** 275 p. About 2900 items in subject groups, many with annotations, p. 24–258. Separate author index. **DWB** (016.6214 S785a). Review in *Science,* Wash., D. C., 130(3389):1651, Dec. 11, **1959.**—The first edition (*see* 7.6–37, June 1956; *Met. Abstracts*) of this compilation contained 1300 references from 317 periodicals to literature up through 1954; the second edition contains over 2900 references from 1955 through 1958, with addition of any material published prior to 1955 that was omitted in the first edition. Arrangement in the first edition was by author; in the present edition it is by subject with an author index at the end. Arrangement under each broad subject is chronological and where needed, cross references are used. World research activities are listed by country. The general subject arrangement is as follows: 1) sources of energy; 2) solar energy, general surveys, reviews, historical, conferences, symposium, bibliographies; 3) solar radiation (constant, transmission, instruments and techniques for measuring sunshine records, and dates); 4) solar radiation effects; 5) uses as heat (low temp.) and 6) uses as light (including use in space vehicles and satellites) with a large number of useful references to solar radiation literature in the appropriate section (p. 48–91); 7) solar radiation bibliographies. *Subject Headings:* **1. Solar energy bibliographies. I. Jensen, Jean Smith** (*ed.*) **II. Association for Applied Solar Energy, Phoenix, Ariz.**—*M.R.*

11.6–45 551.586:612.014.4:016

†Washington (State). University, **Bibliography (on) Climatology and human comfort.** Prepared for the U. S. Weather Bureau and University of Washington Cooperative Project in Climatology. **1948(?)** 29 p. Mimeo. **DWB** (M(016) U587un)—The 422 items listed alphabetically by author or by source, were selected from domestic and foreign periodicals and research literature on meteorology, physiology, medicine, air-conditioning, etc. The unannotated references largely cover subjects where temperature was the dominant factor in human comfort. *Subject Headings:* **1. Comfort climate 2. Bibliography on bioclimatology.**—*W.N.*

B. APPLICATIONS

1. AERONAUTICS

11.6–46 551.511:551.558:629.135.15

§Urfer, Alfred, **Was zeichnete den 21. April 1959 als Tag der Langstreckenflüge aus?** [What was significant on April 21, 1959 for long distance gliding?] *Schweizer Aero-Revue,* Zurich, 34(7):427–431, July **1959.** 8 figs. **DLC**—April 21, 1959 was a very remarkable day and flights covering great distances were made: Stuttgart—Geneva (360 km); Schaffhausen—Bière (230 km); Birrfeld—Geneva (210 km); Birrfeld—Valence (370 km); and Birrfeld—Salon (485 km). The author analyzes the meteorological situation of the week preceding April 21 and gives a detailed description of the atmospheric situation on that day. The reports of the glider pilots are included. *Subject Heading:* **1. Gliding weather.**—*A.V.*

11.6–47 551.509.5:656.71

Huntoon, James K., **Proposal for research to develop precision short-period forecasts of critical weather conditions at jet airports.** Wash., D. C., U. S. Weather Bureau, July **1957.** 22 p. 17 figs., 2 refs. **DWB** (M09.21 U587pr)—Pamphlet describes projects for immediate research on improving accuracy of 5 minute to 1 hour forecasts of ceiling and visibility at major terminals where jet transport planes will be landing before long (i.e., Washington National or Newark Airports). The high fuel consumption of jets when flying at low levels requires accurate probability forecasts which cannot now be made with sufficient reliability. Objective synoptic and climatological studies, analysis of mesoscale effects on ceilings and visibility, establishment of small micro-scale networks at Washington Airport, preparation of aero-

climatic summaries for all major airports in U. S., application of machine or numerical metho etc, are criticized and illustrated. *Subject Headings:* **1. Meso-scale forecast research Aviation forecasting studies 3. Terminal forecasting studies 4. Jet aircraft forecastin 5. Washington National Airport.**—*M.R.*

11.6–48 551.5:06 551.582:629.135.2(71

Longley, Richmond, W. (*Depart. of Transport, Toronto*), **Flying weather in the Far North** *Shell Aviation News*, London, Paris, No. 347(1):7–10, Jan. **1959.** 2 charts. **DWB**—Th article includes a chart showing the location of the weather reporting stations of various type (synoptic stations, radiosonde stations, etc. . .), in northern Canada. Nature of underlyin surface affects strongly the weather in these regions. The main climatic features of thes areas are summarized, especially those concerning snowstorms, temperatures, surface wind clouds and pressure distribution. *Subject Headings:* **1. Networks 2. Climate of norther Canada 3. Northern Canada.**—*A.V.*

11.6–49 551.509.

White, Robert M.; Myers, R. F.; Ward, F. W. and Guy, G. A., **General design for weathe observing and forecasting system 433L.** *U. S. Air Force. Cambridge, Research Cente AFCRC*-TN-57-609, ASTIA Document 133846, Dec. 15, **1957.** 92 p. 15 figs. **DWB** (M09. W587ge)—A report on a comprehensive program for improving the entire meteorological an climatic data, observing, transmitting and processing system for aviation, including forecastin and forecast dissemination. The Air Force problems, both technical and operational, th system design characteristics, the system organization, subsystems, and data processing an display, the development and testing program, and the financial and manpower requirements are treated in separate chapters. Much of the development has to do with automatic observin and distant recording equipment, such as radar, transmissometers and IBM processing ma chines. *Subject Heading:* **1. Data processing systems.**—*M.R.*

11.6–50 551.509.541:629.13:551.57

Houy, J., **Sur l'aspect inhabituel que peuvent présenter certains cumulonimbus vu d'avion.** [The unusual appearance of certain cumulonimbus seen from an airplane.] *La Météorologie*, Paris, 4th Ser., No. 35:253–256, July/Sept. **1954.** 2 figs., table. **DWB**—A case on Feb. 26, 1954, when a meteorological reconnaissance plane, flying from Marseille to Brétigny sur-Orge, encountered cloud formations completely different from those depicted on the fligh plan, is described and analyzed in detail and the actual and forecast cross sections and othe data presented. The observer at the ground was misled into reporting towering cumulus with cirrus above, when actually Ac and at the end Cb clouds, with slightly undulating or growing tops but on an even plane and no cirrus, was encountered. Severe turbulence, hail and shower and lightning was encountered in the Cb, which was not isolated but extensive. **Subject** *Headings:* **1. Flight plans 2. Cloud forecasts 3. Airways forecasts 4. France.**—*M.R.*

2. AGRICULTURE

See also: **Clouds physics and application to agric.,** 11.6–24; **Tomato cultivation** (de Vries), 11.6–284; **Solar radiation effects on plant diseases** (Visser et al.), 11.6–286; **Light effects on plants** (Wellensiek), 11.6–288; **Frost occurrence in tomato growing area** (Vollprecht), 11.6–298; **Temp. effects on phosphate exchange in soil** (Arambarri, Talibudeen), 11.6–299; **Arid zone agric.** (Davitaia), 11.6–337; **Water balance—agric.** (van Himbeeck), 11.6–344.

11.6–51 551.586:633.2(444.1

Hedin, L. and Kerguelen, M. (*Laboratoire des Plantes Fourragères, Rouen*), **Recherches sur la production fourragère dans l'Auxois et sur son intensification.** [Investigations on forag —crop production in Auxois and on its intensification.] *Paris. Institut National de l Recherche Agronomique, Annales, Ser. B, Annales de l'Amélioration des Plantes*, 8(3): 339–388 July/Sept. **1958.** fig., chart, 15 tables, 23 refs. French, English, German and Russian sum maries p. 385–387. **DA**—Auxois is a small natural region in the East of Morvan, spreadin

over about 2,500 km²; its 57,000 inhabitants living almost entirely on meat production of Charo'lais cattle, and milk from cows of the "Tachetée de l'Est" breed and of some "Brunes des Alpes." It is a country with a continental climate; its cultivated soils being mostly liasic marls. The authors study soils and climate as the permanent factors of the agricultural production. The climate of this region is less humid than that of the surrounding regions and more continental (short intermediate seasons, early and late frosts and a second maximum of thundershowers in summer). They study the climatic factors of this region and apply the representative formulas of climate (monthly aridity index and the hygrothermic index of Amann). The point to aim at is to extend the grazing season for winter, by means of foggage and establishment of a rotational grazing system. *Subject Headings:* **1. Forage-crop production 2. Climatic effects on crops 3. Rotational grazing system 4. Auxois, France.**—*A. V. and authors' abstract.*

11.6–52 551.586:631.67:633

Molina Abela, Mariano, **Segunda memoria: resumen de experiencias.** [Second memoria: résumé of work.] *Spain. Instituto Nacional de Investigaciones Agronomicas, Anales,* 6(4): 299–388, **1957.** tables. "Covers 1953–1956. First Memoria covering 1950–1952, in *Anales,* 2(4), 1953." **DLC** (Govt. Pub.R.R.)—Amounts of rainfall and irrigation water applied to crops each month during 1953–6 were carefully noted in each of numerous experiments on irrigation of tobacco, potato, maize and other crops. Data on mean monthly temperature and rainfall at Córdoba for 1901–50 are presented in a table. Rainfall is expressed in m³/Ha as well as in mm in order to be comparable with figures for irrigation water applied. The summary covers results for 1950–56. *Subject Headings:* **1. Agricultural meteorology 2. Irrigation effects on crops 3. Córdoba, Spain.**—*M.R.*

11.6–53 551.524:551.586:633.491

Pichotka, J. (*Germany*), **Die Wirkung der Aenderung von Umgebungsbedingungen auf einfache biologische Systeme.** [The effect of changes in environmental conditions on simple biological systems.] *International Journal of Bioclimatology and Biometeorology,* Leiden, Netherlands, Vol. 2 (Pt. 4), **1958.** 3 p. 4 figs., 2 refs. **DWB**—The author investigated the influences of physical environmental factors upon isolated sections of potatoes under conditions which allowed the sections to retain vital functions. The effect of temperatures of 15–30°C upon metabolism was investigated. Temperature increased metabolic rate. The increase in metabolism for a rise of 10°C was 10–20%. The metabolic regimes can be described as the stabilizations of a regulated system. Within a rather wide range of temperature a constant metabolic rate is attained as a result of a change in the intensity of metabolism. Graphs showing the metabolic rate of isolated potato tissue at various external temperatures and amount of oxygen uptake at O_2-tensions of 4% and 100% O_2 are presented. *Subject Headings:* **1. Temperature effects on plants 2. Plant bioclimatology 3. Potatoes.**—*I.L.D.*

11.6–54 551.524.37:551.586:632.111.5:634.8(43–15)

Vaupel, Albrecht, **Advektivfrost und Strahlungsfrost.** [Advective frost and radiation frost.] *Germany. Deutscher Wetterdienst, Mitteilungen,* 3(17), **1959.** 31 p. 25 figs., 2 tables, 5 refs. German and English summaries p. 5. **DWB**—An extreme invasion of polar air occurring early in May 1957, entailed four days of late frost which did great damage to vine and fruit cultures in Western Germany. The evaluation of upper air soundings and climatological data as well as geomorphological considerations allow to clearly distinguish the two effective types of late frost, namely advective and radiation frost, which are described according to their origin and effects. By means of frost damage records from 1957 taken from maps of the viticulture of the Land Rheinland-Pfalz, a large number of examples (height, exposure, terrain features, flow or barrage of cold air, etc.) are shown for both types of late frost. The conditions in the side valleys of the Moselle and the middle course of the Rhine are dealt with in particular. In these regions the damages are caused by a type of late frost which proved to be an intermediate one between the advective and radiation frosts. *Subject Headings:* **1. Frost damage to plants 2. Radiation frost 3. Viticulture 4. Western Germany.**—*Author's abstract.*

11.6–55 551.577.2(764)

*Waldrip, William J. (*Texas A. and M. College*), **Farming and ranching risk as influen by rainfall, No. 3, Rio Grande Plain of Texas.** *Texas. Agricultural Experiment Station, cellaneous Publication*, No. 241, Nov. **1957.** 35 p. numerous figs., 7 refs. **DWB** (M W167fa)—Continuing a series of studies on rainfall conditions in various parts of Texas, paper contains precipitation data for thirty stations in the Rio Grande Plain (the sout most part of Texas). For each station there is a graphical presentation of a) annual t precipitation, and b) monthly mean precipitation, and brief discussion of rainfall probabili persistence tendencies, and seasonal distribution characteristics. Lengths of the records v from 28 to 86 years. Effects of precipitation distribution upon farming practices are cussed in general terms. *Subject Headings:* **1. Precipitation data analysis 2. Rainfall distri tion 3. Agricultural meteorology 4. Rio Grande Plain, Tex.**—*G.T.*

3. FORESTRY

See also: **Stabilization of sand dunes by afforestation** (Maheut, Dommergues), 11.6–362.

11.6–56 551.588.6:582.477:551.524.3(677

Curry, S. J. and Griffiths, J. F. (*both, Kenya Forestry Dept., Muguga, East Africa Dept., Nairobi*), **Temperature changes within cypress logs in the Kenya highlands.** *Ecol* Durham, N. C., 40(3):490–491, July **1959.** 3 figs. **DWB, DLC**—Temperature measureme were taken within seasoned and freshly felled cypress logs with bark removed and with bark on in sun using dry logs and fresh wet logs, in a constant temperature room, and in in the shade and then in the sun. The temperature variations are presented in graphs. temperature measurements showed that seasoned timber reached much higher temperatu than green wood, values of well over 130°F being recorded. The thermal gradient within logs was very steep. Exposures of Oemida larvae boring near the center of similar logs comparable temperatures in an electric oven showed that they could survive at higher tempe tures sustained for longer periods than those measured in field conditions. As the high temperature measured in the field conditions occurred only near the surface of the seasoned it is considered unlikely that Oemida larvae, boring in the heartwood of both fresh and seaso cypress logs could be killed by the increase in the temperature of the timber resulting from exposure to the sun in plantations. *Subject Heading:* **1. Log temperature.**—*I.L.D.*

11.6–57 551.577.52:551.588.6(4

Noirfalise, A., **Sur l'interception de la pluie par le couvert dans quelques forêts belg** [Precipitation interception by leaf canopy in some Belgian forests.] *Société Royale Fo tière de Belgique*, Bulletin, 66(10):433–439, Oct. **1959. DA**—Statement of experiments rain interception by plant cover made in 3 types of Belgian forests. Description of the exp mental device and account of the results. The mean rate of precipitation interception by tree cover is higher for artificial coniferous forests than for natural deciduous forests. Dur summer, interception in a beech-grove reaches 25% and that of the dense spruce-fir plantati 38%. Annual interception in a oak-grove with birch-trees varies by regions: 29.8% in E bant, 26.8% in Campine. On the other hand, the runoff along the trunks is much higher deciduous than for coniferous forests. This phenomenon influences the water balance surface soils and partly explains the moisture deficiency and the much more pronounced cumulation of mulch in coniferous plantations. *Subject Headings:* **1. Forest microclimatol 2. Precipitation interception by forests 3. Belgium.**—*A.V.*

11.6–58 551.588.6 551.584

Pavari, Aldo, **Les influences de la forêt.** [Influences of forests.] *Unasylva*, Ro 13(1):12–24, **1959.** 3 figs., 3 tables, 12 refs. **DLC**—The influence exerted by forests on th environments is part of a wide system of intricate interrelationships. After giving a classifi tion which includes 7 forest types, author investigates successively the influences of fore on climate, soil and water. Among the factors of forest microclimate, the following items especially considered: solar radiation, air temperature, wind, humidity, soil temperature rainfall. *Subject Headings:* **1. Forest influences on climate 2. Forest microclimatology.**—*A*

11.6–59 551.586:582.717:582.475

Van Arsdel, E. P., **Smoke movement clarifies spread of blister rust from ribes to distant white pines. 1958.** 5 p. 2 tables. Mimeo. Note: A paper presented at the Second National Conference on Agricultural Meteorology, 170th National Meeting of the American Meteorological Society, October 22–24, 1958, at New Haven, Connecticut. **DWB**(M:581.2 V217sm). Abstract is published in *Am. Met. Soc., Bull.*, 39:442–443, **1958.**—The results of the observation of smoke movement along the edge of swamp at varying times of day or night have been recorded. Air movement in thermal circulation has been related to the distribution of temperature. This paper gives the conditions necessary for the spread of blister rust, the climatic distribution of rust on the basis of required weather conditions, the present rust control practices, and a comparison of climatic elements during August 3 to 12, 1957, among many others. *Subject Headings:* **1. Air-borne diseases 2. Plant disease—weather relationships 3. Smoke plume behavior 4. Tracer techniques.**—*N.N.*

11.6–60 632.187:551.556:551.577.62

Bruneton, M., **La lutte contre les incendies de forêts.** [Fight against forest fires.] *Courrier de la Normalisation*, Paris, 24(138):550–557, Nov. Dec. **1957.** 8 photos—table. **DLC**—The composition and state of vegetation and climatic conditions are the determining factors in the susceptibility of forests to fire. Wind, humidity and temperature are the main climatic factors affecting the development of forest fires. The principal causes of forest fires are carelessness, malice, railways and lightning. A table, inserted in the text, gives the relative frequency of these causes. The latter part of this note concerns the methods for extinguishing fires, the organizing of the fight against forest fires (watch stations, labor and material used in France for extinguishing forest fires, transmission, helicopters and "retarding" products). *Subject Headings:* **1. Forest fires 2. Climatic effects on fire danger.**—*A.V.*

11.6–61 551.586:632.187

*Vowinckel, E. (*Forest Research Inst., Pretoria*), **Fire-danger rating.** *South African Association, Journal*, No. 31:58–73, June **1958.** 3 figs., 15 tables, 17 refs. Afrikaans summary p. 58.—A detailed study of forest fires and their causes in South Africa and a comparison with statistics obtained in the U. S. leads to establishment of a fire danger rating system 1) for the starting phase, and 2) for the spreading phase. These rating systems take into account the same physical factors used in similar rating systems in other countries, but are adapted to local conditions of weather and fuel moisture content (or gradients). Data are shown in tables and graphs. *Subject Headings:* **1. Fire danger rating 2. Forest fire studies 3. South Africa.**—*M.R.*

11.6–62 551.507.1:551.508.8:632.187

U. S. Forest Service. Intermountain Forest and Range Experiment Station, Ogden, Utah, **Portable fire-weather station.** (1957?) 15 p. 20 photos. **DWB** (M08.8 U583po)—A new unit, the portable fire-weather station, which is designed to give complete fire-weather information is described and illustrated. It houses instruments to measure rainfall, wind speed, maximum and minimum temperatures, wet and dry bulb temperature and fuel moisture, yet it weighs only about 36 lbs. It can be back-packed, hand carried or dropped by parachute. This paper contains a description of how to set up the station and methods of using the portable instruments in the station. *Subject Headings:* **1. Portable weather stations 2. Fire weather stations.**—*N.N.*

4. MEDICINE AND HEALTH

See also: **Air pollution effects on health** (Manos, Fisher), 11.6–252; **Climate of unheated buildings** (Brill'), 11.6–347; **Discomfort index** (Thom), 11.6–360; **Vapor effects on sweating** (Bass et al.), 11.6–361.

11.6–63 551.586:551.571:581.1

Buettner, Konrad J. K. (*Dept. of Met. & Climat., Univ. of Wash.*), **Die Aufnahme von Wasserdampf durch menschliche Haut, Pflanze und Erdboden.** [Absorption of water vapor by human skin, plants and soil.] *Archiv für Meteorologie, Geophysik und Bioklimatologie,*

Ser. B, Vienna, 9(1):80–85, **1958.** table, 16 refs. German, English and French summari p. 80. **DLC**—Laboratory experiments and field observations show surprisingly high amoun of transfer of water vapor into human skin, into dry and living plants, and into dry soil. Th processes involved seem to be based on diffusion and sorption. These results may be explaine by assuming the existence of high osmotic pressures in skin and in plants; the reason for thi concentration is not yet known. *Subject Headings:* **1. Water vapor absorption by skin 2. Wat vapor absorption by plants.**—*Author's abstract.*

11.6–64 551.590.22:612.0

Points, Thomas C. (*Okla. Univ. School of Medicine*), **After office hours, weather or nc** *Obstetrics and Gynecology*, 11(4):480–484, April **1958.** 2 tables, 3 refs. **DNLM, DWB** In an attempt to verify or dispel some "old wives tales" about the effect of the moon or weathe on delivery time of babies, the author has tabulated 38,668 deliveries in a 5 yr period at Okla homa City, Okla., with respect to phase of the moon, extremely cold days, changes in tempera ture from the previous day, average temperature, sunshine, wind direction, relative humidity barometric pressure, pressure changes and thunderstorm on the day preceding the deliver Conclusion is that none of the deviations from normal (100) was significant though value range from 84 to 118 (for average temperatures of 10–19°F and 90–99°F, respectively). I several instances the finding was the exact opposite of the generally accepted relation. Cond tions at time of conception are considered to be of more probable influence. *Subject Heading* **1. Weather effects on birth 2. Lunar effects on birth.**—*M.R.*

5. INDUSTRY

See also: **Industrial radioactive waste disposal,** 11.6–75; **Climatic effects on power generation** (Arakawa), 11.6–346.

11.6–65 551.578.46:625.7:634.95

Buvert, V. V.; Ionov, B. D.; Kishinskiĭ, M. I. and Syromiatnikov, S. A., **Snow and ic as materials for road construction.** Transl. by N. T. Zikeev and Katherine Martinoff fro the original Russian. *U. S. Snow Ice and Permafrost Research Establishment, Translation* No. 54, May **1957.** 9 p. figs., tables, eqs. Transl. of their **Sneg i led kak dorozhnostroitel'ny materialy,** Ch. 2, p. 202–212, of Pt. 3, of their **Sukhoputnyĭ transport lesa** [Overland haulin of logs], pub. Moscow, Goslesbumizdat, **1951.**—Exploitation of physical and mechanica properties of snow and ice for construction of logging roads by compaction is treated here The theoretical discussion involves ABEL's equation for natural conditions and some Russia scientists' equations for artificial compaction and snow density, etc. Practical experimentatio with compacting devices (i.e. rollers) weighing 1.7, 1.8 and 4.5 tons showed about the sam results of snow cover density, and suggests that better results are obtained if compaction take place in thin layers after snowfalls. Effective design of compacting rollers depend on weight radius and width of rollers modified to suit the properties of snow. Graphical and tabulate presentations of results obtained are included. *Subject Headings:* **1. Snow trafficability 2 Snow roads 3. Logging road construction 4. Translations. I. Martinoff, Katherine** (*transl.*) **II. Zikeev, N. T.** (*transl.*).—*W.N.*

11.6–66 551.556.3:621.311(08)

†United Nations Educational, Scientific and Cultural Organization (UNESCO), **Wind and solar energy: Proceedings of the New Delhi Symposium, Oct. 22–25, 1954.** Its *Arid Zone Research*, Vol. 7, **1956.** 238 p. figs., tables, refs. and bibliogs., eqs. Papers in English or French, with summaries in English or in French and Spanish. (For listing of pertinent papers delivered at this Symposium, *see* Pt. 3, p. 1146, Aug. 1957, *Met. Abstracts.*) **DWB** A general review paper by D. DRESDEN, p. 32–37, contains a discussion of the results achieved by the wind power group of OEEC with international collaboration, cooperative research, wind power studies, economics of wind power and a review of wind power utilization in various parts of the world during the past 50 yrs. The other individual papers are abstracted separately. *Subject Headings:* **1. Wind power utilization 2. Solar energy 3. Symposia. I. Dresden, D.**—*I.L.D.*

11.6–67 551.521.1:621.47 551.556.3:621.311

Golding, E. W., **Sources of energy.** *UNESCO Arid Zone Research*, 9:176–187, **1957.** igs., 45 refs., eqs. **DWB, DLC**—This discussion of sources of energy contains a treatment the general characteristics of wind power, solar radiation and water power, and methods of ng their local power resources. This is followed by a more detailed account of the measure- nts and estimations of energy available from wind and solar radiation. *Subject Headings:* **Energy sources 2. Wind power 3. Solar energy 4. Water power.**—*I.L.D.*

11.6–68 551.556.3:621.311

Golding, E. W. and Thacker, M. S., **The utilization of wind, solar radiation and other local ergy resources for the development of a community in an arid or semi-arid area.** *UNESCO, id Zone Research*, 7:119–126, **1956.** 2 tables, French and Spanish summaries p. 123–125. **WB, DLC**—The authors make a practical approach to the problem of a synthesized and lanced use of wind, solar and fuel power in an arid or semi-arid area. A brief discussion is ven of the energy obtained from wind power, solar radiation and wood and other vegetable tter. This is followed by a more detailed discussion of possible combinations of different ergy sources for various areas in a rural community with reference to timing requirements d quantity estimates of energy loads for various operations. *Subject Headings:* **1. Wind wer utilization 2. Solar energy 3. Arid regions 4. Energy sources.**—*I.L.D.*

11.6–69 551.556.3:621.311.24

Frenkiel, J., **Wind power research in Israel.** *UNESCO, Arid Zone Research*, 7:108–114, **WB, DLC**—This article contains an account of the development of research on the wind ergy in Israel, the possible role of wind power in the overall energy problem of Israel, the sults of the first year of wind surveys made in 1953, and the results of operation of a wind nerator with a Jacobs unit of 3 kw about 30 mi from Eilat. Quantitative data on wind speed wind survey sites are presented. *Subject Headings:* **1. Wind power research 2. Wind ergy 3. Israel.**—*I.L.D.*

11.6–70 551.556.3:621.311(584.1)

Kolodin, Mikhail Vasil'evich, **Veter i vetrotekhnika.** [Wind and wind technology.] shkhabad, Izdatvo. Akademii Nauk Turkmenskoĭ SSR, **1957.** 138 p. 43 figs., 14 tables, refs., 17 eqs. **DLC**—At head of title-page: Akademiia Nauk Turkmenskoĭ SSR, Institut ziki i Geofiziki. **DLC**(TJ825.K6)—The first 4 chapters of this technical monograph cover e usual subjects of wind and its characteristics, wind measuring techniques and equipment nemometry), wind mills (history and contemporary construction), uses of wind machines agriculture and industry (grinding, water pumping, mechanization, heat and electric power oduction) and use of wind energy, throughout the world today and tomorrow. The 5th apter consists of a thorough survey of the climatic and wind conditions of Turkmenistan. xtensive tables give frequencies of various wind speeds (in percent) for various mean and nual wind speeds in different situations: mountain, piedmont, plains, Caspian shore. The harts show regions of greatest wind power potential and isarithm charts show wind frequency the whole area of Turkmenistan. Nomograms are presented and described for use in wind nergy calculations. *Subject Headings:* **1. Wind power utilization 2. Wind energy surveys in .S.S.R. 3. Turkmen, U.S.S.R.**—*M.R.*

11.6–71 551.556.3:621.548

Shevko, E. I., **Vetrodvigateli.** [Wind machines.] Kiev, Gosud. Nauchno-Tekhnich. dat. Mashinostroitel'noĭ Literatury, Ukrainskoe Otdelenie, **1955.** 114 p. 41 figs., 19 ables, 10 refs. **DLC** (TJ825.S46)—A standard bulletin for wind equipment, construction nd maintenance personnel, giving the latest details on the various types of wind machines sed in the agricultural regions of the U.S.S.R. (Types TV-5, UTV-5, D-5, TV-8, D-12 and -15). A short chapter discusses wind and wind power calculations. *Subject Headings:* **Wind machines 2. U.S.S.R.**—*M.R.*

11.6–72 551.556.3:621.311.24

Vadot, L. (*Consulting engineer at Etablissements Neyrpic*), **La production d'énergie élec- ique par éoliennes.** [The generation of electricity by windmills.] *La Houille Blanche*,

Grenoble, 13(5):503–525, Oct. **1958.** English text p. 526–539. 24 figs., tables, eqs. Frenc summary p. 503; English summary p. 526. **DLC**—Two fundamental problems of windmi design are considered in this article: determining the dimensions of the machine and its outpu Economic and engineering considerations make it possible to define the most advantageo characteristics for a windmill. It would seem that, in view of available wind power in th Atlantic region, it is of immediate interest to use wind generators. *Subject Headings:* **1. Win utilization 2. Wind power generators.**—*Author's abstract.*

11.6–73 551.574.42:621.315(43

Maška, L., **Pozorování námraz a námrazová mapa ČSR.** [Icing observations and a icing chart for Czechoslovakia.] *Meteorologické Zprávy*, Prague, 11(4/5): 112–115, **1958.** figs., 4 refs. Czech, Russian and English summaries p. 112. **DWB, DLC**—Observations icing on power lines and on icing meters have been conducted in Czechoslovakia by the Institu of Power Supply since 1955. Instruments and methods used in these measurements are d scribed and illustrated, and a map based on them, showing regions of three different degrees icing severity in Czechoslovakia, is presented. *Subject Headings:* **1. Icing of wires 2. Icin data 3. Czechoslovakia.**—*G.T.*

6. ARTIFICIAL RADIOACTIVITY

See also: **Radioactive sea bottom sediments** (Sastry, Mahadevan), 11.6–190; **Fallout predictor** (Bailey et al.), 11.6–245; **Radioactive fallout mechanism** (Hess), 11.6–262; **Nuclear explosion effects on atmos. elec.** (Kondo), 11.6–371.

11.6–74 551.510.72(52

Japan. Meteorological Agency, Tokyo, **Present status of artificial radioactivity obser vations in Japan.** Tokyo, March **1958.** 32 p. figs., tables, photos. **DWB** (M94.143 J35 pr —The achievement and research development of radioactive observations by 15 station throughout Japan from 1955 to 1957 are outlined. Methods of artificial radioactivity an microbarometric observations are described and results of measurements of radioactivity i the sea, dust movement in the upper atmosphere as derived from air trajectories obtained b airplane and balloon, summary of abnormal microbarometric oscillations by nuclear detona tions, and isochrones of pressure wave propagation are presented. All results are compare with those of other countries. The following conclusions are reached; 1. Radioactive dust are likely to accumulate in the lower stratosphere and their intensity in the upper atmospher reaches 500×10^{-12} μc/cc; 2. The level of gross radioactivity has risen remarkably and Sr^{9} is greater along the Japan Seaside than along the Pacific side of Japan; 3. The rainfall of Japa has a total radioactivity of 0.66×10^{-6} μc/cc. On an average there are 100 to 150 rainy day in Japan, on the other hand, radioactivity of the air shows an average of 260 days with 0.3×10^{-1} μc/cc. in a year. *Subject Headings:* **1. Artificial radioactivity 2. Radioactive fallout data 3. Japan.**—*K. Chung.*

11.6–75 551.510.72:621.039:539.

†U. S. Congress. Joint Committee on Atomic Energy, **Industrial radioactive waste dis posal. Hearings before the Special Subcommittee on Radiation, 86th Congress, First Session Jan. 28, 29, and 30; Feb. 2 and 3, 1959.** Wash., D. C., Govt. Printing Office, **1959.** 4 vol (3057 p.) figs., tables, refs., eqs. **DWB** (621.4838 U583in)—The four large volumes of hear ings on radioactive waste disposal cover: 1) origin and nature of radioactive wastes from nuclea energy activities; 2) treatment of wastes by controlled dispersal at low and intermediate level in the atmosphere, the rivers, oceans, ground, etc. and research on environment of factor associated therewith; 3) disposal of highly radioactive wastes underground and 4) activitie of Federal and State Governments in control and international consideration. Particularl important are the 4 papers which contain extensive reference lists and illustrations; 1) Pack D. H. (*U.S.W.B.*), **Activities of the U. S. Weather Bureau related to environmental an radioactive waste disposal operations** (p. 1527–1578) 177 refs.; 2) Hilst, G. R. (*G. E. Co Hanford, Wash.*), **Meteorologic studies at the Hanford Works** (p. 1579–1604) 9 figs.; 3) Pack D. H. and Hosler, C. R. (*U. S. W. B., Wash.*), **Meteorological study of potential atmospheri**

ontamination from multiple nuclear sites (p. 1605–1618) 8 figs., tables, synoptic charts; 4) OLLAND, J. Z. (*U. S. A. E. C., Wash., D. C.*), **Progress in applications of meteorology to peaceful uses of atomic energy** (p. 1619–1628) 32 refs. There is a statement in Vol. 4 by F. W. EICHELDERFER, Chief of the U. S. W. B. (p. 2578–9) on the Weather Bureau's activities in pecial and general observation of radioactivity in air or of atmospheric conditions affecting dispersal of radioactive wastes; statement by M. H. MERRILL on California's program for adioactive surveillance (p. 2681–2712) and similar reports from Penn., Colorado, Washington tate, etc. Vol. 2 contains a section (4) on **Meteorological studies** (p. 1527–1628). The rest f the material is on ground disposal of radioactive waste. *Subject Headings:* **1. Radioactive aste disposal 2. U. S. Weather Bureau radioactive monitoring program 3. Hanford, Wash. . Reichelderfer, F. W. II. Merrill, M. H.**—*M.R.*

11.6–76 551.508.91:551.510.42:551.510.7

Aleksandrov, N. N., **Polevoĭ radiometr dlia izmereniia otnositel'noĭ kontsentratsii radioktivnoĭ primesi v vozdukhe.** [Field radiometer for measuring relative concentrations of adioactive impurities in the air.] *Leningrad Glavnaia Geofizicheskaia Observatoriia, Trudy,* No. 83:27–35, **1958.** 7 figs., 8 refs., 4 eqs. **DWB, DLC**—The design and operating principles f such a field radiometer are presented and discussed in detail. The instrument operates on wo working bands suitable for the measurement of radioactive impurities concentration in the ir by the way of recording the intensity of emission (radiation). *Subject Headings:* **1. Radioctivity measuring devices 2. Radiometers.**—*A.M.P.*

C. ASTRONOMY AND ASTROPHYSICS

1. ASTRONOMY

See also: **Cosmic physics texts** (Gamow), **11.6–1.**

11.6–77 523.872 551.521.3

*†Andrillat, Henri, **Les températures électroniques des nébuleuses planétaires.** [Electronic emperature of planetary nebulae.] *Annales d'Astrophysique,* Paris, Supplement, No. 1, **1955.** 58 p. 11 figs., 20 tables, 51 refs., eqs. **DLC, DWB**—A detailed monograph giving he complete results of studies of the physics of planetary nebulae based on data for 24 nebulae btained at Haute Provence Observatory (electronic temperature of 8000 to 27,000° (were btained) with a 120 cm telescope. Theory is reviewed in Pt. 1; in Pt. 2 the spectrophotometrically determined temperatures (methods, sources of error, accuracy and comparison of results with those of other authors) are treated. On p. 20 the correction for atmospheric absorption, and on p. 21, for atmospheric dispersion are discussed. Finally, the intensity of rays of hydrogen, helium and [O III] at 5007Å is covered. In Pt. 3 continuous and discontinuous Balmer spectra of gaseous nebulae are treated (atmospheric absorption and dispersion on p. 43). *Subject Headings:* **1. Planetary nebulae temperatures 2. Atmospheric absorption and dispersion.**—*M.R.*

11.6–78 523.7 523.72 523.854

Bok, Bart J., **The arms of the galaxy.** *Scientific American,* N. Y., 201(6):92–104, Dec. **1959.** 9 figs. **DWB, DLC**—A semipopular survey article describing and illustrating known facts and speculative theories regarding the wafer-thin galaxy in which the solar system is enmeshed. The spiral nature which was postulated by analogy has been confirmed by recent optical and radio evidence. The rotation period (of the sun) is about 200 million yrs, and the diameter 80,000 light yrs. Old and new optical models, radio model of the galaxy and magnetic fields in the galaxy are still in the realm of speculation. The problem of the replenishment of the gases, lost by outward motion of the expanding outer arms of the spiral, is also under study and is a subject for debate, as is the origin and age of the spiral arms. *Subject Headings:* **1. Cosmogony 2. Galaxy arms 3. Astrophysics.**—*M.R.*

11.6–79 523.874 523.841.37

†Grandjean, J., **Vitesses différentielles dans l'atmosphère de η Aquilae et de ξ Geminorum.** [Differential speeds in the η Aquilae and ξ Geminorum atmosphere.] *Académie Royale des*

Sciences, des Lettres et des Beaux-arts de Belgique, Brussels, Mémoires, 29(7), **1956.** 60 p. figs., 1 table, 33 refs., 26 eqs. **DLC**—Four spectra of large dispersion 2.9 A/mm, (two o Geminorum and two of η Aquilae), were measured for the determination of radial spee Variations of radial speed could be observed between different groups of rays. Theoreti models of atmospheres were built for eight phases of η Aquilae, and permitted the calculati of the depths of the layers responsible upon formation of the different groups of observed ra Radial speed varies with the depth of η Aquilae and of ξ Geminorum in the atmosphere. *Su ject Headings:* **1. Stellar radial velocities 2. Cepheids.**—*A. V.*

11.6–80 551.551.5:523.82(C

†Keller, Geoffrey; Protheroe, W. M.; Barnhart, P. E. and Galli, J., **Investigations of stell scintillation and the behavior of telescopic images.** Ohio. State Univ. Research Foundati Contract AF 19(604)-1409, Final Report, Dec. **1956.** 175 p. numerous figs., tables, ref eqs. **DWB** (523 K29i)—On p. 1–85 a series of papers on the relation of atmospheric turbulen to stellar shadow patterns and scintillation (revisions of previously published papers, on t whole) are presented in a systematic arrangement; and on p. 86–175, some previously unpu lished work on the relation of atmospheric turbulence to the distortion, motion and interr intensity fluctuations of telescope images; a bibliography of literature; results of observation instrument problems, etc. It is concluded that the distortions of images produced by t thermal distortions of the mirror are more important than those produced by atmospher turbulence. *Subject Headings:* **1. Atmospheric turbulence—stellar scintillation relationshi 2. Stellar scintillation 3. Clear air turbulence.**—*M. R.*

11.6–81 523.873

Kourganoff, V., **Les étoiles chaudes à raies d'émission.** [The warm stars with emissio lines.] *L'Astronomie*, Paris, 72(3):113-117, March **1958.** 3 figs. *Ibid.*, 72(4):152–15 April **1958.** 4 figs. **DLC**—In Pt. 1, the author deals with the classification of the warm star the spectral B-type—with emission lines, called "Be-stars." Among the classification criteri he mentions the character of the lines profile, the motion of which the Be-stars are quickene their luminosity, etc. Pt. 2 deals with the explanatory hypotheses which make it possib to understand, qualitatively, the physical nature of the processes responsible for the observe properties and the theoretical models. The author ends with examinations of three completel independent approaches to the explanation of the emission components in the warm sta with emission lines; 1) differential Doppler's effect (effect DD); b) dilution effect; c) diffusio effect through the free electrons. *Subject Headings:* **1. Stellar emission lines 2. Doppl effect 3. Warm stars.**—*A. V.*

2. SOLAR PHYSICS

See also: **Solar flare effects on cosmic rays** (Anderson et al.), 11.6–108; **Sunspot effects on cosmic rays** (Katzman), 11.6–109; **Solar effects on cosmic rays** (Venkatesan), 11.6–111; **Solar radio emissions** (Krishnamurthi et al.), 11.6–146; **Solar radio radiation obs.** (Medd, Covington), 11.6–147; **Solar aureole** (Diermendjian), 11.6–368.

11.6–82 551.521.67:551.594.12:523.74

De Jager, C., **Interplanetare magnetische Streufelder.** [Interplanetary magnetic dis persion fields.] *Die Sterne*, Leipzig, 35(9–10); 182–188, **1959.** fig., 3 refs. **DLC**—Observa tions of the corpuscular radiation reaching the earth show that the corpuscular solar radiatio associated with solar flares enters the earth's atmosphere suddenly and that this penetratio can continue for a long time. This means that the interplanetary magnetic field between su and earth is weaker than 10^{-6} gauss; for $r > 1.4$ astronomical unit, this value may be of the orde of 10^{-5} gauss. In this case, either the density in the region between sun and earth should b smaller than the usual value 10^3 electrons per cm^3, or the turbulent velocity in this region shoul be very small ($v_t < 10$ m/se). For $r > 1.4$, the value of the magnetic field indicates a highe electronic concentration. In the center of this region, $Ne \cong 2.5 \cdot 10^3$ per cm^3 and the turbu lent velocity is of the order of 1 km/sec. *Subject Headings:* **1. Corpuscular radiation Interplanetary magnetic field 3. Electron density.**—*A. V.* Ⓢ

11.6–83 523.7(04)

Gauroy, P., **Le Soleil, cette étoile.** [The Sun, that star.] *Geographia*, Paris, No. 78:13–, March **1958.** 4 figs. **DLC, NN, NIC**—This note gives some general information about the Sun; distance from earth, mass, temperature, gravity, etc. It includes a description of the photosphere, chromosphere and their own phenomena with characteristic features and properties. *Subject Headings:* **1. Sun 2. Photosphere 3. Chromosphere.**—*A.V.*

11.6–84 523.7:551.506.22

Kopecky, M., **Rabota solnechnogo otdeleniia Astronomicheskogo Instituta Chekhoslovatskoĭ Akademii Nauk.** [Activities of the solar department of the Astronomical Institute of the Czech Academy of Sciences.] *Akademiia Nauk SSSR. Mezhduvedomstvennyĭ Komitet po Provedeniiu Mezhdunarodnogo Geofizicheskogo Goda, Informatsionnyĭ Biulleten'*, No. 3:94–95, 1957. **DLC**—The IGY program of solar studies that will be carried out at Ondrejov Observatory is outlined. The new equipment (monochromatic filter of the Scholtz type for automatic photography of the chromosphere and a new spectrograph) will be ready in time for the beginning of IGY. Methods of processing observation results are described. *Subject Headings:* **1. Solar research 2. Astronomical observatories 3. IGY solar program 4. Ondřejov, Czechoslovakia.**—*A.M.P.*

11.6–85 523.75:551.510.535

*Křivský, Ladislav and Růžičková, Blažena (*both Astronomical Inst., Czech. Acad. Sci. Ondřejov*), **The chromospheric flare effect in atmospherics (IGY 1957).** *Studia Geophysica et Geodaetica*, Prague, 3(2):154–164, **1959.** fig., 10 tables, 10 refs. Russian summary p. 164. **DWB**—This is a synoptic study of the frequency of the geoactive effect of solar chromospheric flares in the lower ionosphere (D layer) as observed in sferics from June to Dec. 1957 at 9 stations in the U. S. S. R. Through analysis of the observed data (Fig. 1 and Tables 1 to 10) it is concluded that: 1) the geoactivity of 1503 chromospheric flares was manifested in 70% of the cases; 2) the asymmetry of the total geoactive effect of flares was in favor of the western half of the disc (0.933); 3) flares in the central zone had a higher percentage of frequency of effect with respect to the boundary parts of the disc; 4) the weakest flares had the smallest frequency of effect. *Subject Headings:* **1. Solar flare effects on ionosphere 2. Chromospheric eruptions 3. Sferics from ionosphere.**—*I.S.* Ⓢ

11.6–86 523.74

Müller, R., **Die Sonnentätigkeit im zweiten Halbjahr 1958.** [Solar activity during the second half-year 1958.] *Die Sterne*, Leipzig, 35(7/8):152–155, July/Aug. **1959.** 2 figs. **DLC**—In August and September 1958, sunspot numbers as high as R∼270 were reached, but in November and December, values lower than 100 were observed during several consecutive days. Statistical data concerning various types of observations made in 1958 according to the IGY program show what a huge amount of solar data was collected through this worldwide cooperation. *Subject Headings:* **1. Solar activity 2. IGY solar data.**—*A.V.* Ⓢ

11.6–87 551.590.21

Pecker, Jean-Claude, **Du Soleil à la terre.** [From Sun to earth.] *L'Astronomie*, Paris, 70(1):27–31, Jan. **1956.** fig. **DWB**—Brief account, with schematic diagram, of solar effects on ionosphere, auroras, ozone layer and effect of solar radiation of every type on biological and other terrestrial phenomena. *Subject Heading:* **1. Solar-terrestrial relationships.**—*M.R.*

11.6–88 523.74

Waldmeier, M., **M-regions and solar activity.** (In: Beer, Arthur (*ed.*), **Vistas in astronomy.** pub. London, **1955–1956.** Vol. 2:808–813. fig., table, 14 refs.) **DWB, DLC** (520.82 B415v)—Bartels in 1932 called the invisible source of solar corpuscular radiation the M-region. This region was later identified with C-region and described by the author (1942–1946). The corpuscular radiation from these M and C-regions has a velocity of 300–600 km/sec. The M-region of July to December 1950 is analyzed and the data shown in table and on graphs. Other attempts to identify the M-regions are mentioned. The M-regions seem to occur at times just before sunspot minima and are preceded by a minimum of *S* and a maximum

of P^* and C^*, with a delay of 2–4 days after S and C^* and of 2 days after P^* (S=sunspo
C^*=reduced corona and P^*=reduced prominences). *Subject Headings:* **1. Solar M-region
2. Solar activity.**—*M.R.*

11.6–89 523.72:541.1 551.590.

Piccardi, Giorgio, (*Direttore dell'Istituto di Chimica fisica dell'Universita di Firenze*
Una precisazione sull'ipotesi solare. [A verification of the solar hypothesis.] *Geofisica Meteorologia*, Genoa, 6(1/2):18, April **1958. DWB**—The solar hypothesis states that th
physical conditions which the earth encounters in the course of a year is the result of its hel
coidal movement within the galaxy. The helicoidal motion is produced by the combinatio
of the earth's revolution around the sun with the translation of the sun towards the constella
tion of Hercules. This hypothesis serves to explain the annual variation of the chemical D-test
which shows a minimum in March. During this month the velocity of the earth in its equa
torial plane is a maximum and the positions of the Northern and Southern Hemispheres ar
symmetrical in respect to interstellar matter. In September its position was symmetrical i
respect to interstellar matter. In a magnetic body such as the earth rotating in an electricall
charged atmosphere, the movement in one direction or another with varying speed is not a
matter of indifference. The standard galactic coordinates of the galactic center are $l=325$
and $b=0°$, those of the solar apex are $l=23°$ and $b=22°$. In March the angle formed by th
vector of the earth's velocity with the direction of the galactic center is a minimum. I
March the earth moves almost parallel to the line of force of a possible radial field (gravitationa
e.g.) and perpendicular to the line of force of a possible dipolar (magnetic e.g.) field. Such a
double condition will not occur again during the rest of the year. The relationship of the D
test to the cosmological field theory is considered briefly. *Subject Headings:* **1. Annual physico
chemical variations 2. Solar influences on chemicals.**—*I.L.D.*

11.6–90 541.124:523.74 551.590.2

Piccardi, Giorgio, **Variazione del test *D* ed attività solare.** [Variation of the *D* test and
solar activity.] *Geofisica e Meteorologia*, Genoa, 6(1/2):19–20, April **1958.** 2 figs. **DWB**—
The author presents a graphical demonstration of the relationship between the chemical *D*-test
and solar activity. The annual variation of the *D*-test was found to show a curve paralle
to the annual variation of log R(R=the *Z*urich sun spot number over the period 1951–1957)
The annual variation of the *D*-test which shows a minimum in March is shown to be inde
pendent of solar activity. The curve of the seven year mean monthly variation of log R
shows no minimum in March but is a somewhat ascending curve. The March minimum of
the *D*-test is statistically significant but the small R minima occasionally noted in March are
not significant statistically. Over a period of 8 years the March minimum of the *D*-test oc
curred regardless of the state of the sun. The behavior of the *D*-test is related to the earth's
motion according to the solar hypothesis. *Subject Headings:* **1. Annual physico-chemical varia
tions 2. Solar influences on chemicals.**—*I.L.D.*

11.6–91 541.124:523.74:550.3 551.590.21

Piccardi, Giorgio, **Sette anni di ricerche coi tests chimici.** [Six years research with chem
ical tests.] *Geofisica e Meteorologia*, Genoa, 6(1/2):21–23, April **1958.** 2 figs. **DWB**—
Between March 1, 1951 and April 1, 1956, 104,452 differential precipitation tests of bismuth
oxychloride were carried out, of these 52,225 comprised the F test; 52,227 the *D* test and 3000
the *P* test. The *F* and *D* tests showed a high correlation with solar and terrestrial activity
The *P* test is related to solar activity and its correlation coefficient with R is the highest eve
found in a relationship between solar and terrestrial phenomena excepting ionospheric phenom
ena. The *P* test shows an annual variation of the sinusidal type (behaving differently from
the *D* test). The various stations at which chemical tests were to be carried out during the
IGY are listed. During the IGY a Committee for Chemical Tests was established by the
International Society of Bioclimatology and Biometeorology. The organization of the
Japanese group on chemical tests is described briefly. A model of the solar hypotheses is
to be placed in the Brussels planetarium in connection with the World's Fair, 1958. The *P*
test procedure at the University of Florence is described and a graph showing the annua
variations of *P* tests at Florence and Genoa is presented. The curves show a similar behavio

he two localities for the same period. *Subject Headings:* **1. Solar influences on precipitation chemicals 2. Bismuth oxychloride precipitation.**

3. PLANETS AND MOON

11.6–92 551.591.31:523.821.2

Koomen, M. J. (*U. S. Naval Res. Lab., Wash., D. C.*), **Visibility of stars at high altitude daylight.** *Optical Society of America, Journal*, 49(6):626–629, June, **1959.** 3 figs., 14 foot- s. **DWB, DLC**—The daylight visibility of stars has been investigated for an observer itude of 100,000 ft, using published visual threshold data and calculated sky luminance. nus, Jupiter, and Sirius, plus Mars at its brighter phases, can be detected with the naked e if the observer knows where to look for them in the sky. Saturn and Canopus may be n only under rare circumstances. A random search of the sky will reveal neither planets nor rs except possibly Venus. If a 10-power telescope of large exit pupil is used, there is a ssibility of detecting an occasional star by careful search of the sky. The daytime sky will t exhibit nighttime luminance until an altitude of roughly 100 km has been reached, assum- ; no contribution from airglow. *Subject Headings:* **1. Daytime visibility of stars 2. High itude optics.**—*Author's abstract.* Ⓢ

11.6–93 551.510:523.4

*†Urey, Harold Clayton, **The atmospheres of the planets.** *Handbuch der Physik*, Berlin, :363–418, **1959.** 3 figs., 11 tables, bibliog., p. 415–418, 24 eqs. **DWB**—This detailed re- ew of knowledge of the planets' atmospheres takes up in order the Earth, Venus, Mars, ercury, the Moon and other satellites and planets, their chemical constituents, energy lance, physical constants, various models, the escape of H_2 and He, history of the atmosphere d origin of life, if any. The bibliography is very complete through 1958. Tabular data are ranged systematically and conveniently for reference purposes. *Subject Headings:* **1. anetary atmospheres 2. Atmospheric composition 3. Atmospheric models 4. Origin of rth's atmosphere.**—*M.R.* Ⓢ

11.6–94 521.2:523.3

Iakovkin, A. A., **Baritsentricheskie koordinaty lunnogo kratera Mësting A.** [Baricentric ordinates of the lunar crater Mösting A.] *Kazan. Universitet, Uchenye Zapiski*,115(13):3– **1955.** 4 tables, 7 refs., eqs. (This is analytic from No. 29 of its subseries, *Astronomich- kiia Observatoriia, Izvestiia*). **DLC** (AS262.K2)—Theoretical calculations are presented in xt and results in extensive tables of observations of the coordinates of center of mass of the ater, by latitude and by longitude. Changes in profile from 1910–1915 are shown by data bulated in appendix based on data obtained at Kazan Observatory. *Subject Headings:* **Lunar crater coordinates 2. Kazan Astronomical Observatory 3. Kazan, U.S.S.R.**—*M.R.*

4. ECLIPSES

11.6–95 551.590.24:551.594.11(52)

Kawamura, M. and Kondo, G., **Atmospheric electric elements on eclipsed day.** *Kakioka, apan. Magnetic Observatory, Memoirs*, 9(1):47–56, March **1959.** 9 figs., 3 tables, 11 refs. n Japanese; English summary p. 47. **DWB**—During the solar eclipse of April 19, 1958, he potential gradient and the conductivity were measured at Kanoya Magnetic Observatory. n this paper, the results of the above observation are described, together with the variations f atmospheric electric elements at Kakioka Magnetic Observatory. According to the results seems that the potential gradient decreases and conductivity increases at the time of eclipse. *ubject Headings:* **1. Solar eclipse effects on atmospheric electricity 2. Potential gradient ariations 3. Atmospheric electricity during eclipses 4. Japan.**—*Authors' abstract.* Ⓢ

11.6–96 523.78:535.24

Rubin, Vera Cooper, **On the relation between photometric observations and geometric ositions of the sun and moon during a solar eclipse, Paper 1.** *Georgetown Univ. Wash.,). C. College Observatory, Georgetown Observatory Monograph*, No. 5; Contract AF 19(604)-880, echnical Report, No. 4, August 7, **1957.** 10 p. fig., 5 refs., 39 eqs.—ALLEN A. GOLDSTEIN

analyzed the data as obtained by the U. S. expedition to Africa and Saudi Arabia during t total solar eclipse Feb. 25, 1952. In the light of the U. S. Naval Observatory's publicati the **Improved Lunar Ephemeris 1952–1959,** GOLDSTEIN's results must be reexamined, whi is the purpose of this complete and thorough analysis. The result is a solution characteriz by directness, ease of calculation, and ready applicability of the equations to any solar eclip here discussed as a total one: limits of integration will differ in other cases. The set-up (1) The analytical form of the expression for the surface brightness is assumed. (2) The eq tion relating the observed solar intensity to the geometrical properties of the sun and the mo is integrated directly. (3) The unknown parameters in the expression for the surface brigh ness of the sun are determined by the method of least squares. *Subject Headings:* **1. Phot metric eclipse observations 2. Solar eclipse, Feb. 1952.**—*W.N.*

5. METEORS

11.6–97 551.590.25:523

†Whipple, Fred L. and Hawkins, Gerald S., **Meteors.** *Handbuch der Physik*, Berlin, 5 519–564, **1959.** 17 figs., 10 tables, numerous refs., 11 eqs. **DWB**—Basic theory of meteo their origin, spectra, dynamics, orbits, dust, visual, photographic and radio observation masses and densities, showers, sporadic meteors, total influx, meteorites, their chemical co position, distribution in space, ablation, ionization, etc. are discussed in review fashion wi ample data and illustrations. *Subject Heading:* **1. Meteors.**—*M.R.* Ⓢ

11.6–98 551.590.25:523

Hawkins, G. S. (*Harvard Coll. Observ. & Boston Univ. Observ.*) and Howard, W. E (*Univ. Michigan*), **Decay of light from a meteor train.** *Astrophysical Journal*, Chicag 130(3):1003–1007, Nov. **1959.** 2 figs., 3 tables, 10 refs., 4 eqs. **DWB, DLC**—The rate of dec of light from a persistent meteor train was measured using a microdensitometer. The deca followed an exponential law at all measured points, and these points were located betwe heights of 84 and 93 km above the earth's surface. At 93 km the light decayed at a rate of 0 magnitudes per second; at 84 km the rate was 1.2. Evidence of radiation from atomic oxyge was found in the early part of the decay curve. A comparison of normal and long endurin trains shows that the rate of decay is controlled by the upper atmosphere and is not depende on the properties of the meteor that produced the train. *Subject Heading:* **1. Meteor tra decay.**—*Authors' abstract.* Ⓢ

11.6–99 551.590.25 523.164.8

Hoffmeister, C., **Das Tagesmeteor vom 6. December 1957.** [The day meteor observed o Dec. 6, 1957.] *Die Sterne*, 35(9/10):161–171, **1959.** 2 tables, 5 figs. **DLC**—A detaile analysis of meteor observations made on Dec. 6, 1957 at 12h25m–12h30m in the region of th Sonneberg Observatory. In particular, the coordinates of the final point of the luminous tra are determined: $\varphi = \text{N } 50°43'.5$, $\lambda = \text{E } 10°47'.0$. The accuracy of the height determination discussed: the value obtained is correlated with the distance D between the projection poi and the observer and a value of the order of 30 km is given by observations made where is higher than 25 km. Accurate determinations of the trajectory and of the velocity are diff cult. A color variation is also reported. Seventy observers reported observations of the noi produced by this explosion and these are discussed in detail. *Subject Headings:* **1. Meteor trail 2. Meteor velocities 3. Meteor echoes**—*A.V.* Ⓢ

11.6–100 551.590.25:551.594.12:551.510.53

Kotadia, K. M. (*Physical Res. Lab., Ahmedabad*), **Meteors and E_s ionization.** *Journ of Scientific and Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplement, De **1958.** p. 46–49. 6 figs., table, 5 refs. **DWB, DLC**—Observations at Ahmedabad and Yamagawa gave evidence for the positive influence of meteors on the sporadic E ionization the Northern Hemisphere. The height of the E_s (or E_{sl}) layer varied between 95 and 105 k Smaller daytime showers produce more pronounced effect than larger nighttime shower The results discussed are presented in curves, ionograms and table. *Subject Headings:* **Meteor ionization 2. Sporadic E layer (Es)—meteor shower relationships.**—*W.N.*

D. OUTER ATMOSPHERE

1. COSMIC AND CORPUSCULAR RADIATION

See also: **Solar corpuscular radiation** (Parker), 11.6–136.

11.6–101 537.59:550.3:551.521.64

Brown, Robert R. (*Dept. of Physics, Univ. of Calif.*), **Excess radiation at the Pfotzer maximum during geophysical disturbances.** *Journal of Geophysical Research*, Wash., D. C. 64(3):323–329, March 1959. 6 figs., 2 tables, 6 refs. **DLC**—Observations of the counting rate of a single Geiger counter at the Pfotzer maximum (~50 gm/cm² atmospheric depth), when compared with nucleonic intensity data obtained with a sea-level neutron monitor, indicate the temporary presence of radiation in excess of normal cosmic radiation during geophysical disturbances at a latitude well below the auroral zone. In the absence of such disturbances, the total intensity variations at the intensity maximum were found to be 2.2 times larger than variations of the nucleonic intensity at sea level. *Subject Headings:* **1. Cosmic radiation 2. Nucleonic intensity variations 3. Geophysical disturbances.**—*Author's abstract.* Ⓢ

11.6–102 551.521.64

†Henkel, J. C.; Lockwood, J. A. and Trainor, J. H., **A comparison of the cosmic-ray intensity at high altitudes with the nucleonic component at ground elevation.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1427–1438, Oct. 1959. 5 figs., 5 tables, 26 refs., 5 eqs. **DLC.** Also issued as: New Hampshire, Univ. Physics Dept., Contract AF 19(604)-550, Scientific Report (unnumbered), (1959). 30 p. 8 figs., 6 tables, 25 refs., 3 eqs. **DWB** M(051) N532sc)—A series of balloon-borne soundings in the atmosphere with single Geiger tubes has been made during the period January to September, 1958. The counting rate determined at the Pfotzer maximum is compared with that recorded by the nucleonic detector at Mt. Washington (1909 m; $\lambda = 55°$N). Large changes in the counting rate of each detector were observed, and the ratio of these changes is ~2:1. Several large deviations from this normal ratio were also observed. These deviations occur for flights on which the shape of the intensity-altitude curve near the Pfotzer maximum is quite different from the normal. These changes are explained in terms of either depressions of the low-energy portion of the cosmic-ray spectrum following marked decreases in the nucleonic component, or the presence of excess low-energy radiation. An anomalous increase of ~100% was observed at high altitudes during one flight and was attributed to high-energy X-radiation. It is found that the hemispherical average unidirectional intensity above the atmosphere derived from the counting rate at the Pfotzer maximum has decreased ~200% from 1954 to 1958 at $\lambda = 53°$N, and this change is compared with results at other latitudes. *Subject Headings:* **1. Cosmic ray variations at high altitudes 2. Nucleonic components of cosmic rays. I. New Hampshire. Univ. Physics Dept. II. Contract AF 19(604)-1550.**—*Authors' abstract.* Ⓢ

11.6–103 551.521.64:539.18

Loktionov, A. A. and Takibaev, Zh. S., **Generatsiia π-mezonov α-chastitsami bol'shoĭ energii kosmicheskikh lucheĭ.** [Generation of π mesons by high energy cosmic ray α particles.] *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, Moscow, 36(6):1697–1702, June 1959. 2 figs., 3 tables, 18 refs., 5 eqs. Russian summary p. 1697; English summary p. 1702. **DWB**—The experimental data are compared with the hydrodynamical theory of multiple meson production. It is shown that for showers with an energy ~10 BeV per nucleon the results of an analysis of the observed star parameters do not contradict the concept of an interaction between the incident alpha particle and a "tunnel" consisting of the nucleons of the target nucleus. *Subject Headings:* **1. Cosmic ray showers 2. Nucleonic components of cosmic rays 3. Meson production.**—*Authors' abstract.* Ⓢ

11.6–104 551.521.64

McCracken, K. G. (*Physics Dept., Univ. Tasmania, Hobart*) and Johns, D. H. (*Antarctic Div., Dept. External Affairs, Melbourne*), **The attenuation length of the high energy nucleonic component of the cosmic radiation near sea level.** *Nuovo Cimento*, Ser. 10, 13(1):96–107,

July 1, 1959. 2 figs., table, 11 refs., 2 eqs. English summary p. 96; Italian summary p. 10
DLC—From the analysis of neutron data obtained at two widely separated stations, it
shown that during 1957 the attenuation length of the high energy nucleonic component of t
cosmic radiation near sea level was (138.1 ± 0.8) g cm^{-2} at high geomagnetic latitudes. Anal
sis of data from a number of stations shows that the amplitudes of Forbush type decrea
increase by about 12% per 1000 m increase in station altitude. This is taken as evidence th
the value of the attenuation length is sensitive to changes in the rigidity spectrum of the prima
radiation, becoming greater as the primary cosmic ray spectrum hardens. It is shown that
sea level near the equator the attenuation length is considerably greater than at high latitude
having a value of about 159 g cm^{-2}. It is shown that the correction for atmospheric chan
can be the limiting factor in the study of small time variations in the primary intensity
means of a measurement of the nucleonic component deep in the atmosphere. *Subject Hea
ings:* **1. Nucleonic components of cosmic rays 2. Cosmic ray variations at sea level.**—*Autho
abstract.* Ⓢ

11.6–105 551.521.

Webber, W. R. and Quenby, J. J. (*both, Imperial Coll. of Sci. & Tech., London*), **On th
derivation of cosmic ray specific yield functions.** *Philosophical Magazine*, London, 4(41):65
664, May 1959. 3 figs., 2 tables, 14 refs., 14 eqs. **DWB**—A series of revised differenti
response curves and yield functions have been deduced for the nucleonic and ionizing com
ponents of the secondary cosmic radiation at various atmospheric depths, using the mo
recent data on the primary spectrum and on geomagnetic cut-off rigidities. *Subject Heading*
1. Cosmic ray properties 2. Nucleonic components of cosmic rays.—*Authors' abstract.* Ⓢ

11.6–106 551.521.64:551.510.71(54

Goel, P. S.; Narasappaya, N.; Prabhakara, C.; Thor, Rama and Zutshi, P. K. (*a
Tata Inst. of Fundamental Res., Bombay*), **Study of cosmic ray produced short-lived P^{32}, P
Be^{7}, and S^{35} in tropical latitudes.** *Tellus*, Stockholm, 11(1):91–100. Feb. 1959. fig., 2 table
13 refs. **DLC**—The fall-out rate of four short-lived isotopes P^{32}, P^{33}, Be^{7} and S^{35}, produce
in the collisions of cosmic ray particles with air nuclei, has been measured at a number of st
tions in India and compared with the calculated rate of production. In the case of Be^{7}, th
agreement between the calculated and measured values is good. The fall-out rates of P^{32} a
P^{33} are not inconsistent with the calculated values; that of S^{35}, however, stayed within fair
narrow limits. The ratio of the concentration of the isotope Be^{7} to that of the isotope P
in individual rain samples has been used to find out the periods for which various air mass
had been irradiated in the interval between two successive precipitations. The mean perio
of irradiation is found to be about thirty-five days. The results are consistent with the vie
that, in these tropical latitudes, intrusions of stratospheric air into the troposphere are eith
rare or weak in intensity. The method seems capable of further development as a tool f
studying meteorological problems. *Subject Headings:* **1. Cosmic ray isotope productio
2. Radioactive isotopes 3. Isotopes in the atmosphere 4. India.**—*Authors' abstract.* Ⓢ

11.6–107 551.521.64:551.510.

Johansson, Sven A. E. (*Dept. of Physics, Univ. of Lund*), **On the influence of cosm
radiation on the isotopic composition of the elements.** *Tellus*, Stockholm, 11(1):101–10
Feb. 1959. 16 refs. **DLC**—When the cosmic radiation interacts with the atomic nuclei
the atmosphere, it produces a great number of stable as well as radioactive isotopes. T
radioactive isotopes are fairly easy to detect but the production of stable isotopes can only
detected by the changes in isotopic composition of the elements that might be caused by th
effect. The amounts of Li^{6}, Ne^{21}, and A^{36} that are produced in this way have been calculate
If the mean intensity of cosmic radiation in the past has been the same as at present it tur
out that the production of these isotopes causes a change in isotopic composition which
barely detectable. A study of this effect gives a possibility of obtaining information about t
cosmic ray intensity in the past. If no cosmic ray effect is found, it shows that the mean cosm
ray intensity in the past could not have been considerably higher than at present. If t
cosmic ray intensity during the earlier stages in the earth's evolution were higher than
present, one could expect easily detectable changes in the isotopic composition of some e

nts. *Subject Headings:* **1. Cosmic ray isotope production 2. Radioactive isotopes 3. topes in the atmosphere.**—*Author's abstract.* Ⓢ

11.6–108 551.521.64:523.75

Anderson, K. A. (*Dept. Physics, Iowa U., Ia. City*), Arnoldy, R. and Hoffman, R. (*th Dept. Physics, Univ. of Minn.*), **Observations of low-energy solar cosmic rays from the re of Aug. 22, 1958.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1133–1147, ot. 1959. 9 figs., 4 tables, 16 refs. **DLC**—Observations have been made of protons at loon altitudes in the energy range 100 to 300 Mev following a solar sequence of optical flare, noise bursts, and long-enduring noise storm. Other particles are shown to have low upper its to their abundance. The flare particles continue to be observed for at least 2 days, and guments are given to show that their storage and emission take place in the solar atmosphere. e differential energy spectrum is derived from ionization versus atmospheric depth data d is found to be $E^{-5}dE$. Observations by riometer and VHF scatter propagation paths er the polar regions indicate that solar acceleration of protons up to roughly 100-Mev energy rather frequent. *Subject Headings:* **1. Solar flare effects on cosmic rays 2. Cosmic ray gin. I. Peterson, L. II. Winckler, J. R.**—*Authors' abstract.* Ⓢ

11.6–109 551.521.64:551.590.21

Katzman, J., **The sun as a source of cosmic rays of intermediate energies.** *Canadian urnal of Physics*, Ottawa, 37(11): 1207–1215, Nov. 1959. 6 figs., 18 refs. **DWB, DLC**—e cosmic ray intensity as measured with an extremely narrow-angle telescope, 1.2×10^{-3} radians, and with 96 inches of lead as absorber for the period 1 Jan. 1955 to 31 Dec. 1958 ows an increase of 20%. This increase is attributed to particles coming from the sun. It is own that the change in hour of maximum of the first and second harmonics can be explained a change in the relative importance of the impact zones. This phenomenon is attributed a change in the number and polarity of sunspots. *Subject Headings:* **1. Cosmic ray intensities Sunspot effects on cosmic rays.**—*Author's abstract.* Ⓢ

11.6–110 550.38:551.521.64

†Quenby, J. J. and Webber, W. R. (*both Imperial Coll. of Sci. and Tech., London*), **Cosmic cut-off rigidities and the earth's magnetic field.** *Philosophical Magazine*, London, 8th ., 4(37):90–113, Jan. 1959. 9 figs., 5 tables, 26 refs., 30 eqs. **DWB**—The authors have duced mathematically the approximate values of the vertical cut-off rigidities for cosmic particles in the earth's magnetic field, taking into account both the dipole and the non-ole parts of the internal field. The article includes the derived formulas for the Störmer atment of the motion of charged particles in a dipole field, that of the magnetic potential the earth, and of the approximate expressions for cut-off rigidities. The accuracy of these lculated values is discussed and they befit the experimental data. Charts of the effective itudes, geomagnetic latitudes, and the dip latitudes of auroral stations are given. Other ails are included. *Subject Headings:* **1. Geomagnetic effects on cosmic rays 2. Cosmic ray f:-off.**—*N.N.*

11.6–111 551.521.64:523.74

Venkatesan, D. (*Nat'l Res. Council, Ottawa, Canada*), **Solar activity and transient decreases cosmic ray intensity.** *Journal of Geophysical Research*, Wash., D. C., 64(5):505–520, May 59. 8 figs., 4 tables, 26 refs. **DLC**—The world-wide character of the intensity changes in son and nucleon components is shown by a study of data from Ottawa, Churchill, and solute during the period Oct. 1956 to Dec. 1957. Further discussion is essentially restricted the mean nucleonic component derived from the three stations. The investigation reveals association between transient decreases in cosmic-ray intensity and the central meridian ssage of active solar regions. On an average, the greater the activity rating of the regions, larger is the cosmic-ray decrease. It is not possible, however, to discuss the relation cifically in terms of the characteristics of the regions, such as flares, sunspots, and the like. rther support for the relation comes from observation of geomagnetic data. Attention is wn to the similarity between small as well as large transient decreases in intensity with ard to presence or absence of recurrence tendency. The study supports the view that both

the 27-day variation and the Forbush events differ only in degree and could therefore be tributed to the same mechanism. It is possible to attribute the cosmic-ray decreases to be of ionized rarified gas emitted from the sun and differing considerably in their characteris *Subject Headings:* **1. Solar effects on cosmic rays 2. Cosmic ray decreases.**—*Author's abstra*

11.6–112 551.521.64:537.5

Alfvén, H. (*Royal Inst. of Technology, Stockholm*), **Momentum spectrum of cosmic ra tion.** *Tellus*, Stockholm, 11(1):106–115, Feb. **1959.** 2 figs., 23 refs., 61 eqs. **DLC**—If variable magnetic field charged high energy particles are injected at a certain point, they accelerated but at the same time they diffuse outwards from the point of injection. Nean point of injection the density in a volume element of six-dimensional phase-space is increa by the acceleration process but decreased by the diffusion, and the momentum spectru obtained from the stationary state when these two effects are equal. The theory gives power spectrum of (51) or (54), in which the value of the exponent depends in a very insensi way on the rate of acceleration and the rate of diffusion. The spectrum depends on the tance from the source of injection and the average energy density is orders of magnitude sma than the density near the source of injection. The theory is in agreement with the "lo theory of cosmic radiation, but it is difficult to reconcile it with galactic or extragalactic theo *Subject Headings:* **1. Momentum spectra of cosmic radiation 2. Cosmic ray theories.**—*Auth abstract.* Ⓢ

11.6–113 551.581:551.52

Brown, Robert R. (*Dept. Physics, U. of Calif., Berkeley*), **Latitude variation of cosmic intensity decreases at sea-level.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 10(2) 65, **1959.** fig., 3 refs. **DWB**—The purpose of this brief discussion is to determine the ex to which latitude variations of intensity, which decrease at sea level, agree with predict based on the modulation function obtained from mountain altitude observations. The cedure is explained and the new calculations are featured in a curve for comparison with earlier curve representing the mountain altitudes. The necessity of sea level neutron moni at low and equatorial latitudes is indicated. *Subject Headings:* **1. Cosmic ray decrea 2. Latitude effects on cosmic rays.**—*W.N.*

11.6–114 551.52

Escobar V., Ismael; Nerurkar, N. and Weil, R. (*all, Lab. of Cosmic Physics, Chacalt Bolivia*), **Sidereal anisotropy of high energy cosmic rays.** *Planetary and Space Science*, N. 1(3):155–160, Aug. **1959.** 4 figs., table, 8 refs. **DWB**—An experiment detecting exten air showers responding to primary energies greater than 10^{14}eV is being conducted at Cha taya, Bolivia (elev. 5220 m; geog. lat. 16° S) with counter trays separated at least by 20 There is evidence of a sidereal anisotropy of about 1.6% with the time of maximum at 1400 I (Local Sidereal Time). The barometric coefficient is discussed in connection with the abs tion curve for extensive showers. *Subject Headings:* **1. Cosmic ray showers 2. High en particles.**—*Authors' abstract.* Ⓢ

11.6–115 551.52

Venkatesan, D. and Dattner, A. (*both, Royal Inst. of Technology, Stockholm*), **Long t changes in the daily variation of cosmic ray intensity.** *Tellus*, Stockholm, 11(1):116– Feb. **1959.** 12 figs., table, 9 refs. **DLC**—Cosmic ray measurements at different stations the period 1937–55 are analyzed. The diurnal variation is found to be a world-wide phen enon, thus giving the anisotropy of the primary radiation and its correlation with solar geomagnetic activities. *Subject Headings:* **1. Diurnal cosmic ray variations 2. Cosmic data.**—*Authors' abstract.* Ⓢ

2. IONOSPHERE

See: IGY ionosphere program (Helliwell), 11.6–21; Solar flare effects on ionosphere (Křivský, Růžičková), 11.6–85; Upper atmos. studies (Unwin), 11.6–116; Upper atmos. studies (Gadsden), 11.6–117, 11.6–118; Fluorescence in upper atmos. (Brandt), 11.6–126; Rocket ionospheric data (Cahill), 11.6–150; **Bibliog. on Ionosphere**, p. 928.

3. AURORAS

See also: **Auroral theories** (Parker), 11.6–136.

11.6–116 551.510.535 :551.594.52 :551.510.62

Unwin, R. S. (*D. P. L. Auroral Station, Awarua Radio, Invercargill, N. Z.*), **Studies of the per atmosphere from Invercargill, New Zealand. Pt. 1, Characteristics of auroral radar oes at 55 Mc/sec.** *Annales de Géophysique*, Paris, 15(3):377–394, July/Sept. **1959.** 13 s., 2 tables, 13 refs. French and English summaries p. 377. **DLC**—Observations with a Mc/sec radar equipment in the south of New Zealand are discussed. Echoes associated h magnetic activity are recognized as being similar to the auroral echoes that have been served in the Northern Hemisphere over the past ten years. They may be divided into four jor types with distinct differences in appearance and times of occurrence. The height and ckness of the region producing the echoes is significantly different for each type, though most ginate from the 110–120 km level. Although recorded during the second half of 1957 at a e of high solar activity, the frequency of occurrence appears to be much greater than at nparable geomagnetic latitudes in the Northern Hemisphere, though diurnal variations similar. Systematic notions of the ionized regions are indicated, with a pronounced north- rd component before local magnetic midnight, and southward after. *Subject Headings:* **Upper atmosphere 2. Radar echoes from auroras 3. Auroral height 4. Auroral ionization Invercargill, New Zealand.**—*Author's abstract.* Ⓢ

11.6–117 551.501.81 :551.594.5 :550.386.6

Gadsden, M. (*D. P. L. Auroral Station, Awarua Radio, Invercargill, N. Z.*), **Studies of upper atmosphere from Invercargill, New Zealand, Pt. 2, Correlation of the radar echoes magnetic activity.** *Annales de Géophysique*, Paris, 15(3):395–402, July/Sept. **1959.** gs., 2 tables, 4 refs. French and English summaries p. 395. **DLC**—Six months' operation a 55 Mc/s radar has shown echoes occurring in 545 cases out of a possible 1220 three-hour iods. Analysis of this data reveals that the probability of occurrence of echoes increases h increasing magnetic K-index, and that this probability is closely related to the local K- ex rather than the planetary K-index. Evidence is found for a "radar auroral zone" whose increases with increasing magnetic activity. It is shown that radar echoes are observed the daytime to a lesser extent than suggested by the diurnal variation of local K-index. *bject Headings:* **1. Radar echoes from auroras 2. Auroral-magnetic relationships 3. K- ex 4. Invercargill, New Zealand.**—*Author's abstract.* Ⓢ

11.6–118 551.501.81 :551.594.5 :550.386.6

Gadsden, M., **Studies of the upper atmosphere from Invercargill, New Zealand. Pt. 3, dar echoes and visual aurorae.** *Annales de Géophysique*, Paris, 15(3):403–411, July/Sept. 59. 3 figs., 2 plates, 2 tables, 10 refs. **DLC**—Evidence is presented and discussed that ds to the conclusion that there is no direct connection between radar echoing regions ob- ved at 55 Mc/s, and visible auroral forms. It is illustrated by graphs that the diurnal iation of the occurrence of an echo observed at any range presents a broad maximum at dnight, whereas the observed auroral probabilities show fairly large fluctuations from hour hour. An indirect association exists since both aurorae (all- and rayed aurorae) and radar oes have a greater probability of occurrence as the K-index increases. But it is also shown, l illustrated by comments of several authors, that for high levels of magnetic activity a one- one correspondence does not exist. Finally, the analysis of series of simultaneous photo- phs of rayed auroral forms and of the radar A-scope, shows that radar echoes are not to be ntified with the rayed arc. *Subject Headings:* **1. Diurnal auroral variations 2. Auroral- gnetic relationships 3. K-index 4. Radar echoes from auroras 5. Invercargill, New uland.**—*A. V.* Ⓢ

11.6–119 551.521.326 551.594.5 :550.386.6

Sandford, B. P. (*D. P. L. Auroral Station, Awarua Radio, Invercargill, N. Z.*), **Studies he upper atmosphere from Invercargill, New Zealand, Pt. 4, Correlation of the intensity he forbidden oxygen lines in the airglow and aurora with magnetic activity.** *Annales de*

Géophysique, Paris, 15(4):445–452, Oct./Dec. **1959.** 6 figs., 4 refs. **DLC**—During a peri of sunspot maximum (1957–1958), a study was made of the intensity of the forbidden oxyg lines in the green and red [OI] 5577Å and 6300Å. The [OI] emissions at 5577Å and 630 tend to increase in intensity with increasing magnetic activity and the enhancement exte over a region of sky far to the north of that where auroral forms usually occur. The depende on magnetic activity seems to be the same, whether auroral structures are present or abse and the results suggest that airglow and aurora may be more closely linked than has b generally recognized. A modified definition of aurora and airglow is suggested that wo retain the distinction between these two phenomena. *Subject Headings:* **1. Forbidden [O lines 2. Night airglow spectra 3. Auroral-magnetic relationships 4. K-index 5. Inv cargill, New Zealand.**—*Author's abstract.* Ⓢ

11.6–120 551.594.5:546.11:535

†Omholt, A., **Studies on the excitation of aurora borealis, Pt. 1, The hydrogen lin** *Geofysiske Publikasjoner*, Oslo, 20(11), Feb. **1959.** 40 p. 12 figs., 2 tables, 39 refs., 12 e **DWB, DLC**—Intensity measurements on the $H\beta$ line and the N_2^+ band λ4709 have been ma in Tromsø with a new photoelectric filter photometer, which is described in some detail. I found that the intensity ratio $H\beta/\lambda4709$ is always very low, usually less than 0.1. $H\beta$ is virtua absent from homogeneous as well as rayed arcs and bands, and from pulsating aurorae, wher $H\beta$ is usually associated with rays and diffuse auroras. The results of some earlier obser tions at Yerkes Observatory are described. At this low latitude $H\beta$ is always present homogeneous arcs, but less intense in rayed auroras. One observation of the break-up per of an arc is described. An attempt has been made to relate the various observations availa and to form a consistent picture of the behavior of the hydrogen lines. The total energy carr into the atmosphere by the primary particles producing the aurora has been computed, a it is concluded that the influx of energy required to maintain an aurora of international brig ness III in the zenith is about 6×10^{13} eV/cm² sec. Some new computations on the emiss of $H\alpha$ and $H\beta$ quanta from a H^+/H beam in air, versus the velocity of the particles, are a presented. The total emission of $H\alpha$ and $H\beta$ quanta per incident proton with initial ene above 200 keV is found to be about 60 and 15, respectively. The possibility of collisio deactivation of the excited H-atoms is discussed. During the period when the particles neutralized (H-atoms) they are not bound to a magnetic field line, and this may be of i portance for the diffusion of a narrow beam of primary particles. The angular distribut of protons which move from near the equatorial plane to the auroral zone is discussed, electric field being taken into account. One may expect that the angle which the paths of fastest protons make with the magnetic lines of force is rather small, but that this angle creases with decreasing energy. The role of the protons in the auroral displays is discus on the basis of the observations and the theoretical results. It is shown that protons can regularly be responsible for the main excitation of any of the discussed types of aurora. is not possible from the intensity of $H\alpha$ and $H\beta$ to derive the absolute flux of protons. Fr the Doppler profiles, it is at present not possible to derive the dispersion in initial velocity the particles, but it is evident that a rather large fraction of these have quite low velocit If we consider all emitting atoms whose directions have an azimuth within an infinitesi small interval $d\varphi$, then the average velocity vector for these atoms makes an angle of ab 24° with the magnetic lines of force. There is evidence that the angular distribution of incident protons varies with the energy as theoretically predicted. *Subject Headings:* **Auroral theories 2. Auroral hydrogen lines.**—*Author's summary.* Ⓢ

11.6–121 551.508.81:551.59

Unwin, R. S. (*D. P. L. Auroral Station, Dept. of Sci. and Indus. Res., Awarua Ra Invercargill, N. Z.*), **Movement of auroral echoes and the magnetic disturbance current syst** *Nature*, London, 183(4667):1044–1045, April 11, **1959.** 2 figs., 11 refs. **DWB**—This p liminary report on radar investigations since 1958 at Invercargill is part of a research prog of the Dominion Physical Laboratory of the New Zealand Dept. of Scientific and Indust Research. The radar operating at 55 Mc/s has its antenna beam orientated alternately geographical bearings of 175° for six min and 240° for four min to avoid possible 210° cente echoes. A histogram of all absolute directions observed in the period May–August featu

movement of echoes in terms of number of occurrences vs. direction, those with an E or W component in direction vs. universal time, and average velocities in the 800–1200 km range vs. Macquarie Island K-index. The echoes came from a layer varying in thickness up to 25 km, and in the altitude between 110 and >120 km. *Subject Headings:* **1. Radar echoes from auroras 2. Auroral data 3. Invercargill, New Zealand.**—*W.N.* Ⓢ

11.6–122 551.594.5:551.506.07(481):551.521.67

†*Vegard, L.; Berger, S. and Nundal, A., **Results of auroral observations at Tromsø and Oslo from the four winters 1953–54 to 1956–57.** *Geofysiske Publikasjoner*, Oslo 20(9), **1958.** 66 p. figs., tables, 19 refs. **DWB, DLC**—This excellent monograph is based on an analysis of auroral spectrograms made at the Tromsø Auroral Observatory and the Physical Institute at Oslo during 4 winters 1953–57. The "V" spectrograph with great dispersive power and the "F" spectrograph of great light power were used at Tromsø; and the "C" and "A" spectrographs at Oslo. Fifteen "V" spectrograms and 139 "F" spectrograms were secured. The theory of solar-terrestrial relationships being tested in this study is that the bundles which produce the aurora and magnetic-ionospheric disturbances in the polar regions have the same general structure as the streamers of the solar corona, although the x-rays producing auroral bundles come from relatively narrow and highly ionized sunspot areas which produce x-rays whose photon energy is >10 times greater than coronal x-rays. Ionospheric temperatures and proton velocities are calculated from the spectrograms and the temperature was found to be the same at top and bottom. Instruments are described and results presented in detailed tables. It is concluded that all celestial bodies surrounded by an atmosphere and hit by strong x-rays will develop the coronal structure (e.g., stars, planets and comets exposed to x-ray from sun or star spectrograms). Also it is concluded that enhancement of red OI-doublet is not produced by electrons, but is due to the positive rays (mainly protons) in the bundle. This enhancement is very pronounced and occurs at great altitudes up to 600 km. *Subject Headings:* **1. Auroral data 2. Coronal effect of solar x-rays 3. Ionospheric temperatures 4. Red OI-doublets 5. Norway.**—*M.R.*

11.6–123 551.594.51:551.521.326:535.242

Murcray, W. B. (*Geophysical Inst College, Alaska*), **Some properties of the luminous auroras as measured by a photoelectric photometer.** *Journal of Geophysical Research*, Wash., D. C., 64(8):955–959, Aug. **1959.** 3 figs., 8 refs. **DLC**—Intensity of the auroral radiation from the entire sky as a function of time was monitored photoelectrically at College, Alaska. Measurements extended over two years. Very good correlation was found between the 3914Å band of N_2 and the 5577Å line of OI. An intensity-time curve of a typical auroral display is shown. A diurnal variation curve is obtained which is very consistent, giving the same form for weak, moderate, and strong aurorae, and showing no evidence of seasonal variation. A rapid fluctuation in the intensity of radiation is reported. *Subject Headings:* **1. Auroral luminescence spectra 2. Photoelectric photometry of auroras.**—*Author's abstract.* Ⓢ

11.6–124 551.594.5:550.371

Hessler, V. P., **Aurora borealis.** *Arctic*, Montreal, 12(1):58–59, March **1959. DLC**—A picture of aurora borealis was taken at 2200 local time on Feb. 23, 1957, on the campus of the University of Alaska, College, looking almost due north. There is a close relation between earth-current disturbances and the auroral displays. *Subject Headings:* **1. Auroral photographs 2. Auroral-magnetic relationships.**—*N.N.* Ⓢ

4. AIRGLOW

11.6–125 551.521.326

Barbier, D. (*Inst. d'Astrophysique, Paris*) **Sur les variations systématiques des intensités des principales radiations de la lumière du ciel nocturne à l'observatoire de Haute-Provence.** [Systematic variations of the intensity of the principal radiation of night airglow at the Haute Provence Observatory.] *Annales de Géophysique*, Paris, 15(3):412–414, July/Sept. **1959.** 3 figs., table, 5 refs. **DLC**—Study of the systematic fluctuations with the solar cycle of radia-

tions 5577Å and 5900Å of night airglow, and of radiation in correlation with them. The year fluctuation of the green line, and radiation of the same family, presents two principal maxima one in summer, the other in autumn, and a secondary maximum in Feb.–March. The relativ importance of the principal maxima varies with the radiation considered. From Nov. to Fel the diurnal variation of the green line intensity presents a maximum about midnight. Fro May to Aug., the green line intensity increases slightly between beginning and end of the nigh It remains constant during the other months. From Nov. to March, the D line intensit increases after 10 p.m. but is constant all night long during the other months. *Subject Hea ings:* **1. Night airglow 2. Radiation intensity variations 3. Haute Provence, France.**—*A. V.*

11.6–126 535.2:551.521:551.510.53

†Brandt, John C. (*Yerkes Obs.*), **Solar Lyman-β fluorescence mechanism in the upp atmosphere.** *Astrophysical Journal*, Chicago, 130(1):228–240, July **1959.** 4 figs., 3 table 27 refs., eqs. **DWB, DLC**—The atmospheric Bowen mechanism is investigated on the bas of Chandrasekhar's theory of radiative transfer, and the total day airglow intensity of λ844 OI is estimated at 500 rayleighs. The twilight intensity is negligible (about 1 rayleigh in disagreement with Shklovskiĭ's estimate. The distribution of atomic oxygen above 10 km can be deduced from the theory of radiative transfer and observations of λ8446 O at different heights. *Subject Headings:* **1. Airglow intensity 2. Fluorescence 3. Atom oxygen distribution.**—*Author's abstract.* Ⓢ

11.6–127 551.521.326:535.3

†Kvifte, G., **Nightglow observations at Ås during the I.G.Y.** *Geofysiske Publikasjone* Oslo, 20(12), June **1959.** 15 p. 4 figs., 6 tables, 27 refs., 4 eqs. **DWB, DLC**—A gratin spectrograph with linear dispersion 35 and 50 Å/mm (dependent on grating and spectral orde has been used in the study of night airglow in the spectral range from 5100Å to 7300Å. Apa from the forbidden OI lines and the *Na I* doublet, the *NI* (5200Å) doublet, the red *NII* fo bidden lines (6548/83Å) and a sharp H_a line seem to be permanently present in the nightglo A covariance of the intensities of the *NII* and the H_a lines, possibly also with *OH* bands, reported. The (0.0) and (0.1) bands of the N_2^+ negative system have been observed in th 4th order spectrum superposed on the 3rd. Accurate wavelengths of 8 *OH* bands in th visible region are given. From these, and previously published data, rotational energy leve for the vibrational states $v=0$ to 9 of the OHX^2II state have been computed. Absolut intensities of 4 *OH* bands are estimated. The rotational temperature, derived from *OH* band (6.1) and (9.3), is found to be 215°K. *Subject Headings:* **1. Night airglow data 2. Gratin spectrometers 3. Ås, Norway.**—*Author's summary.* Ⓢ

11.6–128 551.593.55:535.33:546.33 535.4:551.593.

*†Donahue, T. M. and Stull, V. Robert (*Univ. of Pittsburgh, Pittsburgh, Penn.*), **Excitatio of the sodium twilight glow.** *Annales de Géophysique*, Paris, 15(4):481–515, Oct./Dec. **1959** 15 figs., 10 tables, 23 refs., eqs. **DLC**—Calculation of the intensity of the sodium *D* lines an the D_2/D_1 ratio in twilight as a function of angle of solar depression and sodium abundance i presented. Resonance and Rayleigh scattering, single and multiple, as well as absorptio and refraction are taken into account. The incident solar intensity is computed, includin the Doppler effect of the motion of the earth on the Fraunhofer lines. The result of thes calculations is a prediction of the total D line intensity and the ratio D_2/D_1 throughout twilig for sodium thicknesses up to 50×10^9 atoms/cm² for the special case in which observations ar made at a zenith angle of 75° in a plane perpendicular to the sun's rays. The intensity passe through a minimum 2° to 3° after sunset, rises to a maximum and then decreases as the laye enters the shadow, first of the ozone and then of the troposphere. The *D* line ratio behave in a somewhat similar fashion. The results for various angles of solar depression are also give as functions of sodium abundance. The total intensity reaches a maximum for 25×1 atoms/cm² and decreases rather slowly for larger amounts of sodium. The D_2/D_1 ratio de creases monotonically but also changes rather slowly for large abundances. The effect o Rayleigh scattering in sending light from the lower atmosphere to the sodium layer, where it i again scattered, and in scattering light from other parts of the sodium-layer into the line o

light of the observing instrument is large and so can contribute seriously to fluctuations. So also is the effect of these processes and absorption in the lower atmosphere on the D_2/D_1 ratio in late twilight. A 10% seasonal variation in the ratio of morning to evening intensity is predicted because of the shifting of the Fraunhofer lines, which results from the combined orbital and spin motion of the earth. The sodium temperature is taken as 220°K. The hyperfine components lie 1.11×10^9 sec^{-1} below the centroid of the line for the *b* component and 0.66×10^9 sec^{-1} above for the *a* component. *Subject Headings:* **1. Twilight sodium 2. Sodium D line intensity 3. Rayleigh scattering 4. Doppler effect.**—*A. V. and authors' abstract.* Ⓢ

11.6–129 551.593.55:546.33:535.33

Nguyen, Huu-Doan, **Rapport des intensités des raies D_2 et D_1 du sodium émises dans la haute atmosphère au crépuscule et pendant la nuit.** [Ratio between the intensities of the sodium D_2- and D_1-lines emitted in the upper atmosphere at twilight and during the night.] *Académie des Sciences, Paris, Comptes Rendus,* 249(5):739–741, Aug. 3, **1959.** fig., table, 9 refs. **DWB, DLC**—The ratio *R* of the intensities of sodium D_2-and D_1-lines has been measured following various methods at twilight and in the course of the night. At the Haute Provence Observatory, author compares directly the nocturnal and crepuscular ratios *R*, by means of the interferential multiplate standard connected with a 10 cm focus length objective. The principal characteristics of the interferential filters, datá relating to exposure times, and sensitivity of the plates are given. The ratio ($R=1,9$) of the intensities of the D_2- and D_1-lines, measured by interferences during the night, is near the ratio of the transition probabilities. The smaller values found at dawn twilight ($R=1,6$) and evening twilight ($R=1,4$) put the self-absorption effect into evidence. But *R* depends further, in a large measure, on solar depression, vertical distribution of sodium, absorption by the ozonosphere and the lower atmospheric layers. *Subject Headings:* **1. Sodium D-line emission 2. Twilight sodium spectrum 3. Ozonospheric absorption 4. Interferential filters 5. Haute Provence Observatory, France.**—*A. V.* Ⓢ

5. GEOMAGNETISM

See also: **Hist. of geomagnetism** (Pochtarev), 11.6–14; **Geomag. effects on cosmic rays** (Quenby, Webber), 11.6–110; **Auroral-magnetic relationships** (Gadsden), 11.6–117, 11.6–118; **Auroral-magnetic relationships** (Sandford), 11.6–119; **Auroral-magnetic relationships** (Hessler), 11.6–124.

11.6–130 538.24 550.384.3

Roberts, P. H. (*Univ. of Durham, King's Coll., Newcastle-upon-Tyne*), **Propagation of induced fields through the core.** *Annales de Géophysique,* Paris, 15(1):75–86, Jan./March, **1959.** 3 figs., 7 refs., 9 eqs. French and English summaries p. 75. **DLC**—A study is made of the hydromagnetic propagation of small magnetic disturbances from a source within a finitely conducting fluid to its boundary. The results are applied to the problem of the rate of growth of the magnetic field due to the centers of secular change. *Subject Headings:* **1. Magnetic disturbances 2. Hydromagnetic propagation 3. Magnetic field growth rate.**—*Author's abstract.*

11.6–131 538.24 550.382.3:551.25

Kalashnikov, A. G., **Some results of investigation of magnetic properties of rocks and geological bodies.** *Annales de Géophysique,* Paris, 15(1):67–74, **1959.** 15 figs., 2 refs. **DLC**—A series of experimental investigation permitted examination of magnetization heterogeneity on open magnetic circuits on various bodies. Experiments on cubes of artificial rocks with a 30% content of magnetite, isothermally magnetized in a homogeneous field, prove that a cube is magnetized nonhomogeneously. The value of the intensity of magnetization changes symmetrically from the middle to the extremes, behaving differently on different lines. In its middle part the cube is magnetized homogeneously in direction, but not in value. The distribution of the remanence vector has also been studied in a body modelling a double folding of a geological stratum. *Subject Headings:* **1. Magnetic properties of rocks 2. Heterogeneity of magnetization 3. Magnetization distribution 4. Thermal magnetization.**—*A. V.*

11.6–132 550.382.3:551.2

Petrova, G. N., **On magnetic stability of rocks. The influence of the coercive force on the stability of rocks.** *Annales de Géophysique*, Paris, 15(1):60–66, **1959.** 8 figs., 2 tables. **DLC**—In the present work an attempt is made to trace the relation between stability and coercive force. It is shown that the magnetic stability of rocks is not evaluated only by the coercive force, because of the multiple origin of their magnetization. The three types of magnetization differ from each other not only in quantity but also in quality. The fact that to destroy equal ideal, normal and thermoremanent magnetizations there must be different steady fields, alternating fields, different temperature and time shows that each of these corresponds to a different internal energetic state and to a different distribution of domains. There is indirect dependence of thermomagnetization on the value of the coercive force, for the greater the coercive force of the material, the greater is J_{rt}/J_r (the ratio of the thermoremanence to the isothermal remanence). *Subject Headings:* **1. Magnetic stability of rocks 2. Magnetization types 3. Thermal magnetization.**—*A. V.*

11.6–133 550.384.8

*†Thellier, E. and Thellier, O. (*Inst. de Physique du Globe de Paris*), **Sur l'intensité du champ magnétique terrestre dans le passé historique et géologique.** [The intensity of the earth's magnetic field in ancient historical and geological times.] *Annales de Géophysique*, Paris, 15(3):285–376, July/Sept. **1959.** 5 figs., 31 tables, 131 refs. French and English summaries p. 285–286. **DLC**—Archeo- or paleomagnetic studies are devoted generally to the direction of the magnetic field in ancient times; the present paper deals with the intensity of this field. Successive phases of the method which the authors have developed since 1937 for this purpose are explained, followed by a general perspective of its results. The paper can be divided into two parts, each one including three chapters. In the first part, after a brief summing up of the basic facts, the procedures which have been used to find the intensity of the ancient magnetic field are examined. Then the authors' method, which consists of comparing thermoremanent magnetization given artificially to a sample with that which the same sample possessed in nature, is described. A systematic series of trials are necessary in order to eliminate, one by one, the numerous defects which prevent making a safe use of the method in its simplest form. Some results are brought out incidently regarding the last several centuries. The second part consists mainly of a presentation of the results which have been obtained for historical times, classified by epochs and by geographical regions (Gallo-romain epoch for France and Switzerland, Punic epoch at Carthage). The massive decreasing of the intensity of the earth's field which has been observed in Western Europe over the last 2000 years, is discussed in regard to possible interference with the Carbon 14 method for dating purposes. Brief results are then given for geological times but only, at least thus far, for the Quaternary epoch. The paper ends with different suggestions as how to extend the present work of determining the intensity of the field. Most of the basic material in this paper was presented at one of the meetings held by the International Association of Geomagnetism and Aeronomy during the General Assembly of the Union of Geodesy and Geophysics, Sept. 1957, in Toronto. *Subject Headings:* **1. Magnetic field intensities 2. Paleomagnetism 3. Thermoremanent magnetization 4. Carbon 14 dating 5. Historical period 6. Quaternary period.**—*Authors' abstract.*

11.6–134 550.384.8

Runcorn, S. K. (*Dept. of Physics, King's Coll., Newcastle upon Tyne*), **On the theory of the geomagnetic secular variation.** *Annales de Géophysique*, Paris, 15(1):87–92, Jan./March **1959.** fig., table, 6 refs. French and English summaries p. 87. **DLC**—A basic assumption made in the interpretation of the directions of magnetization of rocks, which are the presumed directions of the field at the times of the formation of the rocks, is that the mean direction of the field over times long, compared with the periods of the secular variation, is that of a geocentric dipole oriented along the axis of the earth's rotation. The relative rotation of the core and mantle, inferred from the westward drift of the geomagnetic field and the irregular fluctuations of the length of the day, is shown to imply that, even if a permanent nondipole field could be generated in the core, the nonaxial parts would be averaged out by observations over a long time at the earth's surface. The relative rotation is also shown to give an explanation for the clockwise rotation of the geomagnetic field vector observed at points on the earth's surface

which is found when observatory records are available over a long period of time. *Subject Headings:* **1. Secular geomagnetic variations 2. Geomagnetic field vector rotation.**—*Author's abstract.*

11.6–135 550.371:550.38:551.590.2

Yokouchi, Yukio, **Earth-current observation at Kanoya.** *Kakioka, Japan. Magnetic Observatory, Memoirs,* 9(1):7–20, March **1959.** 11 figs., 7 tables, 12 refs. Japanese summary p. 7. **DWB**—It has been noticed since the beginning of the observation that there is a fairly large amount of lunar variation in the earth-current potentials observed at the Kanoya Observatory. It is desirable to know more precisely the status of the solar and lunar diurnal variations to get plausible interpretation of its physical mechanism. These variations have been computed for the period 1950–1953 and are reported in this paper. *Subject Headings:* **1. Earth currents 2. Lunar diurnal magnetic variations 3. Solar-magnetic relationships.**—*Author's introduction.*

11.6–136 551.521.67:551.594.5:550.388.8

†Parker, E. N. (*Fermi Inst., Univ. of Chicago*), **Interaction of the solar wind with the geomagnetic field.** *Physics of Fluids,* N. Y., 1(3):171–187, May/June **1958.** 11 figs., 29 refs., 17 eqs. **DWB**—The dynamical properties of the solar wind blowing past the geomagnetic field are investigated by considering the effective viscosity and the resulting transition layer thickness. The collision of ions in the solar wind produces a negligible viscosity in the flow past the geomagnetic field, but such an inviscid flow is shown to be unstable. The resulting disordered interface between the field and the wind yields Fermi acceleration of ions and consequently a not insignificant effective viscosity. The Fermi acceleration results in suprathermal ions which may have an energy spectrum like that observed for primary auroral protons. The auroral zones and the agitated nature of the polar geomagnetic field are shown to follow from the depth of penetration of the solar wind into the geomagnetic field. The injection of gas into the geomagnetic field is studied. The effect at Earth of the distortion of the outer boundary of the geomagnetic field is computed; no matter how unevenly and anisotropically the outer field is distorted, the effect at Earth is a nearly uniform perturbation field which is closely parallel to the geomagnetic axis. Pushing in on the outer field increases the horizontal component at Earth, and pulling out decreases it; the total increase of the horizontal component is the algebraic sum of all the pushing and pulling. The simultaneous world-wide onset and the main phase of a geomagnetic storm follow. The common tendency of large and/or violent bodies of plasma to produce suprathermal particles is noted and suggested to be a general dynamical property. *Subject Headings:* **1. Solar corpuscular radiation 2. Auroral theories 3. Solar-geomagnetic relationships.**—*Author's abstract.*

11.6–137 550.385.43

Gerard, V. B. (*Dept. of Sci. & Indus. Res, Christchurch, N. Z.*), **The propagation of world-wide sudden commencements of magnetic storms.** *Journal of Geophysical Research,* Wash., D. C., 64(6):593–596, June **1959.** 2 figs., 4 refs., table. **DWB, DLC**—A study of the times of three sudden commencements, recorded on Aug. 3, Sept. 21, and Nov. 6, 1957, respectively, at ten widely-separated magnetic observatories, indicates that when main and preliminary impulses are both recorded at one place (as in the typical SC*) they really begin approximately simultaneously. Therefore, it would appear that in nontropical regions the rate of growth of the so-called preliminary impulse is usually greater than that of the main impulse, so that the latter is obscured until the former begins to decay. Differences around the earth between recorded times of the first impulse, whether the sudden commencement is an SC or SC* type, are only a few seconds, and the evidence suggests that the position of the sun controls the hemisphere in which the sudden commencement first occurs. This finding is interpreted in terms of the Singer shock-wave theory to mean that, as would be expected, the shock wave enters the auroral zone nearest the sun first and produces the sudden commencement a few seconds earlier in that hemisphere. At the equinox, the sudden commencement times are, roughly, symmetrically distributed with respect to the geomagnetic equator. *Subject Headings:* **1. Sudden commencements 2. Magnetic storms.**—*Author's abstract.* Ⓢ

11.6–138 550.371:550.385.3

Yoshimatsu, Takasaburo, **On the frequency of geomagnetic pulsations observed in Japan during the IGY, Pt. 1.** *Kakioka, Japan. Magnetic Observatory, Memoirs*, 9(1):27–32, March **1959.** 4 figs., table. Japanese summary p. 27. **DWB**—According to the form of repor of the bureau of the IAGA Committee 10 on **Rapid variations and earth currents** at Elbrc Spain, data of pulsations, pt and pc, are concerned mainly with their times of occurrence, thre kinds of class distinctness of appearance (A, B and C) but not the amplitude, period and othe characteristics of the waves, even for the class A pulsations. So as far as these data are con cerned, the first important attempt to deal with the pulsations is to clarify their time frequencie as well as their characteristics of the occurrence and distribution in the scale of the globe or i the regional extent. Along this line of intention, the frequencies of the geomagnetic pulsation observed at the IGY stations in Japan are preliminarily summarized in this note. *Subjec Headings:* **1. Earth currents 2. IGY geomagnetic program 3. Geomagnetic micropulsation 4. Japan.**—*Author's introduction.*

11.6–139 534:538.6

Bazer, J. and Ericson, W. B. (*both, New York Univ.*), **Hydromagnetic shocks.** *Astro physical Journal*, Chicago, 129(3):758–785, May **1959.** 8 figs., 13 refs., 81 eqs. **DWB, DLC**— All physically admissible solutions of the hydromagnetic shock relations for an ideal polytropi gas are exhibited and classified by purely analytical means. The state ahead of the shoc (i.e., on the low-density side) is assumed to be known; no restriction is placed on the direction of the magnetic field in front. It is shown, apart from certain "limit" shocks (e.g., pure ga shocks), that the shock velocity and the quantities characterizing the state behind hydromag netic shocks may be expressed as simple algebraic functions of the discontinuity in the magneti field across the shock. A natural classification of all hydromagnetic shocks, based on thi representation of the state behind the shock, is given. Several useful analytical propertie of the various types of hydromagnetic shocks are derived. The results are illustrated graph ically for the case of an ideal monatomic gas. The relation between earlier schemes of classifi cation and the present scheme is discussed. *Subject Headings:* **1. Hydromagnetic shock 2. Magnetic field effects.**—*Authors' abstract.* Ⓢ

6. RADIO ASTRONOMY

See also: **Electromagnetic pin-point sources** (Bouix), 11.6–261.

11.6–140 523.164(02

*†Shklovskiĭ, I. S., **Kosmicheskoe radioizluchenie.** [Cosmic radio frequency radiation.] Moscow, Gosud. Izd-vo Tekhniko-Teoreticheskoĭ Literatury, **1956.** 492 p. 167 figs. (incl photos), 25 tables, 220 refs., eqs. **DLC** (QB475.S42) (3000 copies). Transl. into Englis with title, **Cosmic radio waves,** issued Cambridge, Mass., Harvard Univ. Press, **1960.** 444 p 205 figs., 27 tables, bibliog. p. 414–428, eqs. **DLC**—A standard monograph or textbook o radio astronomy for scientists and technicians, covering in 27 chapters (grouped in 6 sections the following aspects: History of radio astronomy since JANSKY'S discovery 25 years ago antennas and equipment, basic results of observations of cosmic radio radiation, nature o Galactic radio radiation, monochromatic radiation from the Galaxy (21 cm), radioastronomy and problems of the origin of cosmic rays, and finally radio radiation from the Metagalaxy and its contribution to cosmology. The book emphasizes radiation from outside the sola system. *Subject Headings:* **1. Radio astronomy textbooks 2. Cosmic radio radiation.**—*M. R.* Ⓢ

11.6–141 523.164(02

Shklovskiĭ, I. S., **Radioastronomiia.** [Radio astronomy.] Moscow, Gosud. Izdatvo Tekhniko-Teoreticheskoĭ Lit., **1955.** 294 p. 128 figs. (incl. photos), foot-refs. **DLC** (QB574 S45 1955)—This revised and enlarged edition of the 1953 text (*see* 7.6–5, June 1956, *Met. Abstracts*) contains chapters on techniques in radioastronomy, radio radiation from a quiet and from a disturbed sun, from the moon, from the galaxy, hydrogen (21 cm) radiation, radio stars and their discovery, cosmic rays and relation to galactic radio radiation, radio nebulae, radio galaxies and relation to the Meta-galaxies, and radiolocation in astronomy. Many illustra

ions of equipment and results of photography and recording of radiation from galaxies by optical and radio means in the U.S.S.R. are included for popular, as well as scientific use (25,000 copies published). Chapters on radio nebulae and location of discrete sources have been considerably enlarged and brought up to date. *Subject Heading:* **1. Radio astronomy textbooks.** *M–M.R.*

11.6–142 523.164(02)

Iwanowska, Wilhelmina, **Radioastronomia.** [Radio astronomy.] Warsaw, Panstwowe Wydawnictwo Naukowe, **1957.** 159 p. 72 figs. (incl. photos). **DLC** (QB475.13)—A popular scientific brochure covering the basic principles and applications of Radio-astronomy. Pt. I discusses methodology: radio frequency radiation and absorption, and radioastronomy equipment (telescopes, antennae, dipoles, reflectors, interferometers, spectrometers, etc.), and Pt. II covers the results of observations of radio frequency radiation from sun, planets, comets, meteors, galaxies, and other sources. Data and information through 1955 are included. The pamphlet is well illustrated. *Subject Headings:* **1. Radio astronomy textbooks 2. Polish language textbooks.**—*M.R.*

11.6–143 523.164.32

Mayer, C. H.; McCullough, T. P. and Sloanaker, R. M. (*all Radio Astronomy Branch, U. S. Naval Res. Lab., Wash., D. C.*), **Measurements of planetary radiation at centimeter wavelengths.** *Institute of Radio Engineers, N. Y., Proceedings,* 46(1):260–266, Jan. **1958.** 6 figs., table, 11 refs., 3 eqs. **DLC**—Radiation from the planets, Venus, Mars, and Jupiter, has been measured at wave length of 3.15 cm using the Naval Research Laboratory 50-ft reflector and a narrow-band radiometer. The apparent blackbody temperatures for Mars and Jupiter derived from the radio measurements agree reasonably well with the results of infrared radiometric measurements. For the case of Venus, the apparent blackbody temperature derived from the 3.15-cm measurements is about a factor or two higher than the value derived from the infrared measurements. A measurement of the radiation from Venus at 9.4-cm wavelength was made using the same antenna. The apparent blackbody temperature derived from this measurement agreed well with the value derived from the 3.15-cm measurement, but the accuracy of the 9.4-cm result was low because of the small flux density of radiation and the small number of observations. *Subject Headings:* **1. Radio astronomy 2. Radio radiation from planets.**—*Authors' abstract.*

11.6–144 523.164 522.1:621.396.633

Marchal, Anatole F., **L'univers mystérieux des radiotélescopes.** [The mysterious universe of radio telescopes.] *Industrie,* Brussels, 13(11):736–758, Nov. **1959.** photos. **DLC**—Excellent synthesis of the advancements and results obtained in radio astronomy. Within a decade, radio astronomy has crossed the boundaries of the Galaxy and has forced its way deeper and deeper into extragalactic space. The radioelectric study of the sun led to a better knowledge of solar activity phenomena and their associated geophysical and geomagnetic consequences. The study of discrete radio sources, of meteors and auroras, gives evidence of certain irregularities of the ionosphere and the process of the upper atmosphere. Author draws a parallel between the progress made in radioelectricity and that achieved in radio astronomy. Pt. 1 of this article sets out the discovery of Karl G. Jansky, gives the description and functioning principles of radar, radio telescope and interferometer. Solar radio astronomy, galactic radio astronomy, radio radiation of the Metagalaxy are reviewed in Pt. 2. Radio astronomy and structure of the universe and planetary radio astronomy are the subject of Pt. 3. Photographic records issued from the principal radio astronomical observatories of the world illustrate remarkably this article. *Subject Headings:* **1. Radio astronomy 2. Radio telescopes.** —*A.V.*

11.6–145 523.164:061.3

Haddock, F. T. (*Mich. Univ., Ann Arbor*), **Report on URSI Commission V: Radio astronomy.** *National Research Council, Wash., D. C., Publication,* No. 581:115–118, 1958. Also issued as *Institute of Radio Engineers, Proceedings,* 46(7):1373–1375, July **1958. DWB, DLC**—The Commission on Radio Astronomy is concerned with international exchange of

scientific data, theory, programs of investigations and coordination of observational program on an international scale, continuous monitoring of solar radio emissions, radio emissio coordination of ursigrams, etc. Radio astronomers from over a dozen nations attended th conference. A summary is given of the work done recently in study of solar radio researcl radio sources, radio propagation, radio waves in the Galaxy and radio planetary system emi sions from the planets. *Subject Heading:* **1. Radio astronomy research.**—*M.R.*

11.6–146 523.164.3

Krishnamurthi, M.; Sivarama Sastry, G. and Seshagiri Rao, T. (*all Physical Lab. Osmani Univ., Hyderabad*), **Radio emission from the sun at 30 Mc/s.** *Journal of Scientific and Indu trial Research, Sec. A*, New Delhi, 17(12), Special Supplement, Dec. **1958.** p. 71–73. tabl 5 refs. **DWB, DLC**—The observations tabulated and discussed were conducted from May to Aug. 31, 1958 by instrumentation described in detail. No radiation from the direct sun wa observed, indicating its temperature at this frequency <52,000°K since the minimum detec able difference between source and background is calculated to be 40,000°K. Enhance radiation was observed 40 times, of which only four could be associated with flares. *Subje Headings:* **1. Radio emission from sun 2. Solar radio emissions.**—*W.N.*

11.6–147 523.164.3

Medd, W. J. and Covington, A. E. (*both, Natl. Res. Council, Ottawa, Canada*), **Discussio of 10.7-cm solar radio flux measurements and an estimation of the accuracy of observation** *Institute of Radio Engineers, N. Y., Proceedings*, 46(1):112–118, Jan. **1958.** 5 figs., 2 table 12 refs., 11 eqs. **DLC**—The accuracy of the daily 10.7-cm solar flux measurements taken a the Nat'l. Research Council, Ottawa, has been investigated. The various system parameter are examined and an auxiliary experiment, using a horn antenna, is described. These studie lead to a revision of the early values of the solar flux and require the use of conversion facto to some of the published data. It has been estimated that the relative error between observa tions separated by intervals of months may be ±10% during 1947 through 1949, and ±3% during subsequent years. The systematic error in 1952–1953 was estimated at 7%. *Subje Headings:* **1. Solar radio radiation observations 2. Ottawa, Canada.**—*Authors' abstract.*

11.6–148 546.11:541.28:621.396.1:523.7

Rudkjøbing, Mogens (*Ole Roemer Observ., Univ. of Aarhus*), **The continuous absorptio coefficient of ionized hydrogen at radio wave lengths.** *Annales d'Astrophysique*, Paris, 22(2) 118–122, March/April **1959.** 2 tables, 10 refs., 21 eqs. French, English and Russian sum maries p. 118. **DWB, DLC**—A general expression for the hydrogen free-free absorption coe ficient, derived wave-mechanically, is shown to agree asymptotically with a formula based o Kramers's classical results in the limit of long wave lengths and for physical conditions suc as those in the solar corona or in dense nebulae. *Subject Headings:* **1. Absorption coefficie of ionized hydrogen 2. Radio wave lengths 3. Solar corona.**—*Author's abstract.* Ⓢ

7. ASTRONAUTICS, SATELLITES AND ROCKETS

11.6–149 551.507.362.2:535.3

†Boudouris, G.; Bournazel, J. and Vassy, E., **Mesures sur l'effet Doppler-Fizeau des sate lites artificiels.** [Measurement of Doppler-Fizeau effect with artificial satellites.] *L'Ona Electrique*, Paris, 39(393):934–938, Dec. **1959.** 5 figs., 30 refs. French and English sum maries. **DLC**—After a short résumé of Doppler effect associated with satellites, a simpl experimental layout, based on Lissajous figures, is described. A rapid graphical-analytica method of reading off the results is described. The final precision is 5% at the maximum o the Doppler curve and ±1 sec. for the determination of its inflexion point. *Subject Heading* **1. Doppler-Fizeau effect 2. Satellite observations.**—*Authors' abstract.* Ⓢ

11.6–150 551.510.535:551.507.362.1:551.508.9

†Cahill, Laurence J., Jr. (*Dept. of Physics, State Univ. Iowa*), **Investigation of the equatoria electrojet by rocket magnetometer.** *Journal of Geophysical Research*, Wash., D. C., 64(5)

9–503, May 1959. 19 figs., table, 21 refs. **DLC**—A small rocket magnetometer has been veloped for use in investigation of electrical currents in the ionosphere. In three flights near e magnetic equator, electrical currents were detected. The equatorial electrojet was found consist of at least two layers of electrical current, one layer near an altitude of 100 km and e other 20 to 25 km higher. A current flowing in the opposite direction to the main electrojet rrent was found to the north of the electrojet. *Subject Headings:* **1. Magnetometers 2. ocket ionospheric data.**—*Author's abstract.* Ⓢ

11.6–151 551.501.8:551.507.362.2

Harris, I.; Jastrow, R. and Cahill, W. F. (*all, Theoretical Div., Nat. Aero. and Space dmin., Wash., D. C.*), **Determination of satellite orbits from radio tracking data.** *Institute Radio Engineers, N. Y., Proceedings,* 47(5, Pt. 1):851–854, May 1959. fig., 2 tables, 9 eqs. **WB**—A computer program has been developed which permits an approximate determination a satellite orbit for a minimal amount of tracking data. *Subject Headings:* **1. Satellite orbits Radio satellite tracking 3. Electronic computer applications.**—*Authors' summary.* Ⓢ

11.6–152 551.507.362.2:629.19:378(47)

Problems on artificial satellites of the earth. *American Journal of Physics,* N. Y., 27(2): –94, Feb. 1959. From original Russian in *Fizika v Shkole,* 18:80–84, May/June 1958. rans. by Haym Kruglak. **DWB**—A number of fundamental problems of satellite velocity, bits or trajectories, of weightlessness within a satellite, posed by 4 teachers of schools for ildren 13–18 years of age in Sverdlovsk, Kazakhstan, Moscow, etc., are presented and their athematical solutions given. *Subject Headings:* **1. Satellite orbit problems 2. Teaching of tronautics 3. Soviet scientific education 4. U.S.S.R. I. Kruglak, Haym.** (*transl.*)—*M.R.* Ⓢ

11.6–153 629.19:551.509.3

Williams, Trevor I., **The exploration of space.** *Endeavour,* London, 18(71):115–116, ly 1959. **DWB, DLC**—A number of possibilities for rewarding discoveries in space research e outlined and the practical value, such as in weather forecasting, is stressed and the con- usion reached that space exploration should be an international venture rather than a com- titive national undertaking with limited publication of results. It is especially important at other countries besides the U. S. and U.S.S.R. take part in programming the instrumenta- on for the satellites. This is partially provided for by a recent plan for British instrumenta- on of satellites. Space cannot be explored by private ventures such as were important in ploration of the earth. *Subject Heading:* **1. Space exploration.**—*M.R.* Ⓢ

E. SOLID EARTH GEOPHYSICS

1. GENERAL GEOPHYSICS

See: **Geophysics symposia,** 11.6–17.

2. GEODESY

11.6–154 525.3:551.241

Danjon, André, **Détermination du déplacement du pôle à partir des variations périodiques es longitudes.** [Determination of polar displacement from periodic variations of longitudes.] *cadémie des Sciences, Paris, Comptes Rendus,* 249(2):206–211, July 15, 1959. 1 fig. 7 refs. **WB, DLC**—Analysis of the periodical or quasi-periodical variations of the uncorrected time ch as supplied at a given place by astronomical observation. Interpretation of the results order to infer pole displacement. Author sketches a program of research and co-operation tween theoreticians and astronomer-observers, geophysicists, meteorologists, etc., in order improve our knowledge in this field. *Subject Headings:* **1. Polar displacement 2. Longi- de variations.**—*A.V.* Ⓢ

11.6–155 531.75:551.5

Murphy, Thomas (*Dublin Inst. for Advanced Studies, Ireland*), **The changes of sensitivi and drift rate of a Worden gravimeter with time and temperature.** *Geofisica Pura e Applica* Milan, 43:209–217, May/Aug. **1959.** 5 figs., table, 4 refs. English and German summar p. 209–210. **DWB, DLC**—The analysis of the readings taken with a Worden gravimeter duri field work over a period of four years when compared with tests in a laboratory shows that behavior is not dependent on vibration and that the drift can be separated into two distin parts; an isothermal drift and a thermal drift. The former is remarkably constant over sh and long periods of time and is of the order of 0.01 mgal/hour. The latter is complicated an dependent on the rate of change of the ambient temperature being different in amount a sign, for quick and slow changes of temperature. The sensitivity changes slowly with tim 0.1% per year, and is only slightly affected by temperature. Tares or jumps in the readin are very rare. Modifications to the meter are suggested, consisting of the inclusion of a rheos in the lighting circuit and the attachment of a thermometer to the outside of the instrume In order to keep the correction for drift to a small size and to increase the accuracy, retu to a base station should be made according to changes in the ambient temperature rather th at fixed time intervals. *Subject Headings:* **1. Gravimeters 2. Temperature effects on gra imeter readings.**—*Author's abstract.*

11.6–156 526.7:531.51:550.3

*†Stahl, Pierre, **Liaison gravimétrique France-Terre Adélie.** [Gravimetric connecti France-Adélie Land.] *Expéditions Polaires Françaises, Expéditions Antarctiques: Résulti Scientifiques*, Ser. S, III, Vol. 3, Paris **1958.** 272 p. 69 figs., 82 tables, 41 refs. English a German summaries p. 264–265. **DWB**—The repeated gravimetric surveys carried out Greenland called into existence a calibration base at Paris-Sèvres in France. During the sout ern summer 1952–1953, also the Antarctic has been connected to this base point. The wo was performed in two main stages, starting with a two-way air link, in segments of under 8 milligals, between Paris and Hobart, Tasmania. From Hobart, the journey was pursued sea to Adélie Land, with stops at Auckland Island, N. Z. and Macquarie Island. Addition trips connected the Kerguelen Isl (2 stations) with Tasmania. and New Caledonia with Sydne Altogether 125 stations were set up or visited outside France. The larger part of the public tion is concerned with a description of the two thermostat gravimeters constructed by t Western Geophysical Co-No. 42 Equatorial and No. 47. The former was modified for t purpose of the Paris-Tasmania link, while the "Polar" characteristics of No. 47 were retain in order to measure the high values of corrections made on the instruments. After discussi of the usual corrections for temperature and pressure, a study is made of variable instrume drift and the perturbations due to changing pressures in the course of transport by air. Gra imeter WG 42 Eq was calibrated four times with Paris-Toulouse as a base. The results, in t form of a list of values as measured, are expressed in the so-called "Paris-Toulouse" syste which is related to Potsdam and directly linked with the absolute measure of gravity recent obtained at Sèvres. These results are considered to be correct to ±1 mgal, even at remo stations, in the system adopted. As a rule the closing errors were of the order of 0.1 mga the one-way measurement without return check between Adélie Land and Tasmania, w corroborated to within a mgal by a two-way measurement made independently in 1956 J. Martin. The work ends with some considerations on systematic errors, comparisons wi modern pendular measurements and those carried out with other types of gravimeters. T thickness of the Polar ice cap in the Antarctic is worked out for two points with the help the gravimetric anomalies observed. This work follows a General Report on the 1952–19 Survey, the provisional conclusions of which it corrects. For the sake of compliance wi future conventions concerning the first order world gravimetric network, five stations ha been connected: Paris, Rome, Beirut, Singapore and Melbourne. *Subject Headings:* **1. Gra imeters 2. Gravimetric networks.**—*Author's abstract.*

11.6–157 551.543:551.593.1:526

*Levallois, J. J. and Masson d'Autume, G. de, **Etude sur la réfraction géodésique et nivellement barométrique.** [Study of geodetic refraction and barometric levelling.] Par **1953.** 116 p. figs., forms, tables, eqs. Also, bound with this: **Annexe: Observations, tabl**

nériques [Supplement: observations, numerical tables.] Paris, **1953** (i.e. 1954). Entirely les. At head of t-p. of each: Ministère des Travaux Publics, des Transports et du Tourisme, titut Géographique National. **DLC** (QC895.14)—A sizeable monograph treating in Pt. 1, 6 major chapters, of I. Experimental observations concerning atmospheric refraction, its le, relation to temperature and height, anomalies, effects of meteorological phenomena, ct of proximity to ground and techniques; II. Classical theory of atmospheric refraction: t-Bouguer theory, coefficient of refraction, astronomical refraction, theory of temperature dient (dry and saturated adiabatic) and stratification; III. Attempt at finding a law for an temp. distribution; IV. Study of an actual case, V. Experiments of the Institut Géophique National 1947–51; VI. Results of Experiments. Pt. 2, **Barometric levelling** uls in Ch. I with the Classical theory, in Ch. II with the bases for a new method and in Ch. III h applications. The new theory of barometric levelling is similar to that for geodetic raction in Pt. I, in that it does not assume a homogeneous atmosphere. Many tables and nograms are included. Radiosonde data and surface observations were used extensively l are given in appendix in tables, or in tables or graphs in text. *Subject Headings:* **1. Geoic refraction 2. Atmospheric refraction 3. Barometric levelling.**—*M.R.*

11.6–158 550.340 550.342:525.6

Brein, R., **Über die Messung kleinster Schwereänderungen.** [The measurement of very all variations of the earth gravity.] *Zeitschrift für Instrumentenkunde*, Berlin, 67(11): 1–284, Nov. **1959.** 5 figs., 7 refs. **DWB**—A sensibility of 10^{-11} of the earth's gravity may obtained on gravimeters by known and tested means without difficulty. Suggestions are en concerning circumstances which will facilitate such an accuracy. In particular the ibration of the gravimeters is discussed. Furthermore, problems are mentioned of measur- techniques for recording earth tides: site of the station to be selected with consideration the microseismic character of the region; careful consideration should also be given to the uracy of the thermostat controlling the temperature stability of the recording room, and the influence of pressure variations. *Subject Headings:* **1. Gravimeters 2. Earth tides Microseisms.**—*A.V.*

3. GEOTHERMY AND VOLCANOLOGY

11.6–159 550.361:536.41

Verhoogen, John (*Dept. of Geol. Sci., Univ. of Calif., Berkeley*), **Thermal expansion of ids and the temperature at the boundary of the earth's core.** *American Geophysical Union, ansactions*, 36(5):866–874, Oct. **1955.** fig., 5 tables, 14 eqs., 12 refs. **DWB, DLC**—The pirical relation $\alpha T = b(T/\theta)^{1.5}$ where b is a constant and θ the Debye temperature, represents isfactorily the variation with temperature T of the coefficient of thermal expansion α at ordiry pressure. The dimensionless constant b is found to have the same value $(24.7 \pm 4.5) \times 10^{-3}$ a large number of substances, including oxides, silicates, and diamond. Limits can be set the variation of b with pressure. Taking values of α and θ at the core's boundary from smic data, and solving the above relation for T, it is found that the temperature at that pth is not likely to exceed 2700°K. *Subject Headings:* **1. Underground temperatures 2. ermal expansion of rocks.**—*Author's abstract.*

4. SEISMOLOGY

11.6–160 550.34

Academia Sinica. Institute of Geophysics and Meteorology [and] Peking University. partment of Geophysics, **Preliminary study of the magnitude-energy relation.** *Science cord*, Peking, 3(6): 234–238, June **1959.** fig., table, 7 refs., 12 eqs. **DLC**—A preliminary dy is presented on the relation between the magnitude and energy of earthquakes. Magnides are determined from both surface (M_s) and body waves (M_b) of 32 earthquakes of normal pths, most of which were recorded in 1957 and 1958 in Chinese stations. All epicenters are ated in China or in its vicinity. The corresponding energies $E_{p,s}$, radiated from the earthakes are calculated and the relation between magnitude and energy is shown in table and aph. Methods of SOLOVIEV and SHEBALIN are used to determine M_s; the method of GUTEN-

BERGH and RICHTER for determinations of M_b and the theory of ZOEPPRITZ to calculate I The formula most appropriate for the region considered is $\log E = 9.5 + 1.6\,M$, $(4 < M <$ where E is in ergs. *Subject Heading:* **1. Earthquake magnitude-energy relationships.**—*A*

11.6–161 550.340:534.64

Sutton, George and Oliver, Jack (*Lamont Geol. Obs., Columbia Univ., N. Y.*), **Seismogra of high magnification at long periods.** *Annales de Géophysique*, Paris, 15(4):423–433, O Dec. **1959.** 9 figs., 13 refs. **DLC**—Several types of high magnification seismographs v peak response at periods between about 7 and 80 seconds are operated at the Palisades stat of the Lamont Geological Observatory. Comparison of the seismograms from these inst ments, and of the appropriate theoretical and experimental frequency-response characterist illustrates their value for the detection and resolution of the long-period components of b body and surface waves. New vertical-component seismographs detect surface waves fr small shocks at very great distances and, apparently for the first time, record microseisms in 10–30 second period range almost continuously. Two other types of seismographs are opera throughout the world in a cooperative program with other institutions during the Internatic Geophysical Year. *Subject Headings:* **1. Seismographs 2. Microseisms 3. Lamont G logical Observatory, Palisades, N. Y.**—*Authors' abstract.*

11.6–162 550.34(6

*Herrinck, P. (*Service Météorologique du Congo belge*), **Séismicité du Congo Belge: comp tion des séismes observés aux stations climatologiques entre 1909 et 1954.** [Seismic activ in the Belgian Congo: compilation of seisms observed at climatological stations between 1 and 1954.] *Académie Royale des Sciences Coloniales, Classe des Sciences Naturelles et Médic Mémoires in 8°*, 9(5), **1959.** 55 p. chart. Mostly tables. **DWB**—Analysis of the qualitat observations of seisms made by the Congolese climatological stations from 1909 to 1954 ma it possible to establish a seismism chart of Belgian Congo. Examination of this chart rev two major seismic regions: Bunia-Bogoro on lake Albert and Usumbura-Kitega-Ruta Urundi. In these regions, the instability zone of the graben is rather well pronounced. T regions of less importance are situated near Baudouinville on lake Tanganyika and near Lusa bo-Luluabourg in Kasai. No seismic activity occurs in Lower Congo. The tables pres the co-ordinates of the stations, dates and hours of seismic observations and the number seisms felt at each station during the period 1909–1954. *Subject Headings:* **1. Seismol 2. Belgian Congo.**—*A. V.*

11.6–163 534.64:550.34:622.

Peterschmitt, Elie, **Ondes séismiques engendrées par des effondrements dans le bas minier de Briey.** [Seismic waves generated by collapses in the mining basin of Briey.] *A démie des Sciences, Paris, Comptes Rendus*, 248(26):3728–3729, June 29, **1959.** fig. **DW DLC**—The seismic study of the recordings made during the collapse at Roncourt (France) Jan. 16, 1959, has brought to light, besides classical waves, other waves closely related to mechanism of the collapse. The distribution of the first motions of compression and dilat is interpreted. The recordings secured under these circumstances differ from recordings natural seisms, peculiarly by the large amplitude of the surface waves. The periods gener observed are great, ranging about 21. The mechanism at the seat of a collapse is certai much less intense than that of a tectonic seism. *Subject Headings:* **1. Seismic waves Collapses in coal basins 3. Briey, France.**—*A. V.*

11.6–164 534.64:550

Mathey, Raymond and Rocard, Yves, **Performances de certains séismographes à cou période.** [Performances of certain short-period seismographs.] *Académie des Scien Paris, Comptes Rendus*, 248(24):3462–3464, June 15, **1959.** fig., ref. **DWB, DLC**—Comme relating to some typical signals obtained with vertical seismographs timed on a period of and equipped with an electronic amplifier giving the instrument an adjustable gain which reach 1 million. Five seismic recordings were obtained from explosions or short trem coming from distances ranging from 3.5 to 8550 km. Possibility to record smaller explosi at great distances is discussed. Through the electronic amplifier, the limitation of these seis graphs is no longer a question of the apparatus but arises from the earth's residual moti

It seems certain that, by means of these instruments, explosions of 10 or 20 t become recordable from distances ranging about 2300 km, at least at favorable locations. *Subject Heading:* **1. Seismograph sensitivity.**—*A. V.*

11.6–165 551.506.1:550.340(492)

*Netherlands. Meteorologisch Instituut, **Seismic records at De Bilt, Vol. 41, 1953,** publ. **1959.** 36 p. Entirely tables. Price: f 1.75.—The data given in this yearbook have mostly been obtained from Galitzin records. The first table shows the characters of the microseismic activity for all the days during the year 1953. A general table gives the date, phase, time, direction, period and amplitude of each seismic record at De Bilt. *Subject Headings:* **1. Seismic data. 2. De Bilt, Netherlands.**—*A. V.*

11.6–166 550.34:532.59(261)

Crenn, Y. and Metzger, J. (*Observatoire de M'Bour*), **Quelques observations d'ondes de Rayleigh de séismes atlantiques enregistrés à la bordure du continent africain.** [Some observations of Rayleigh waves from Atlantic seisms recorded at the border of the African continent.] *Annales de Géophysique*, Paris, 15(4):555–560, Oct./Dec. 1959. 7 figs., 3 refs. **DLC**—The seisms of the Atlantic Ocean, which reach the continent after having passed a shallow, show as vertical surface waves forming a very regular train of Rayleigh waves. The seisms which reach the continent directly show few Rayleigh waves but do produce other waves having a vertical component with a period of 10 to 15 sec. *Subject Headings:* **1. Seismic waves 2. Rayleigh waves.**—*A. V.*

11.6–167 550.342:551.465:532.593

Hieblot, James and Rocard Yves (*Laboratoire de Physique, Ecole Normale Supérieure, Paris*), **Contribution à la théorie des microséismes.** [Contribution to the theory of microseisms.] *Annales de Géophysique*, Paris, 15(4):539–546, Oct./Dec. **1959.** fig., 26 eqs. French and English summaries p. 539. **DLC**—Standing waves at the surface of the ocean are known to transmit to the sea bed pressure variations capable of generating microseisms. This paper is devoted to the calculation of these variations with and without taking water compressibility into account. In the latter case waves of expansion are found to travel vertically in the sea and the energy transmitted to the earth is calculated. At a distance of several thousand miles, some very strong explosions generate seismic signals in a frequency range to some extent covered by the microseismic frequency range. It is estimated that a comparison between acting energies with regard to observed displacements is permissible; results are satisfactory. *Subject Headings:* **1. Microseisms 2. Ocean wave propagation.**—*Authors' abstract.*

11.6–168 550.34

Jobert, Nelly, **Calcul de la dispersion des ondes de Love de grande période à la surface de la Terre.** [Calculation of the dispersion of large period Love waves at the earth's surface.] *Académie des Sciences, Paris, Comptes Rendus*, 249(11): 1014–1016, Sept. 14, **1959.** 2 figs., 7 refs. **DWB, DLC**—By integrating the differential equation of motion the phase speed of large period Love waves is obtained. Earth model used is K. BULLEN's model (A). Calculation bears on the fundamental mode and the first harmonic. The results for the fundamental mode agree with experimental results. *Subject Heading:* **1. Love waves.**—*A. V.*

5. TECTONICS

11.6–169 551.240:550.34

Perrin, René, **Réflexions sur des observations de G. S. Gorshkov et les théories sur le volcanisme et l'orogenèse.** [Comments on G. S. Gorshkov's observations and the theories regarding volcanism and orogenesis.] *Académie des Sciences, Paris, Comptes Rendus*, 249(15): 1303–1306, Oct. 12, **1959.** fig., 2 refs. **DWB, DLC**—The propagation of seismic waves from epicenters has been observed lately at Kliuchi station (Kamchatka). All the recordings of seisms, from either near or relatively distant epicenters show the propagation of the lateral S waves as well as of the longitudinal P waves, except those corresponding to the Southern part of Japan where only P waves occur. The S waves occur at all other azimuths, as also for the epicenters located on the same azimuth but which are either nearer or more distant

than Southern Japan. These observations led G. S. GORSHKOV to the conclusion that the most probable explanation of this "shadow zone" is the existence of a "screen for S waves" formed by a localized liquid pocket, limited in height and depth and situated under the volcanic group. G. S. GORSHKOV has estimated the depths of summit and bottom of this pocket to 50 and 70 km respectively. The analysis of these results led the author to conclude that GORSHKOV's observations seem qualitatively correct and that the present state of knowledge does not allow to consider them as quantitatively exact and to build up theories on these quantitative studies. *Subject Headings:* **1. Seismic wave propagation 2. Structural geodynamics 3. Orogenesis.** —*A.V.*

F. OCEANOGRAPHY, HYDROLOGY AND GLACIOLOGY

1. OCEANOGRAPHY

See also: **Marine biol.**, 11.6–2; **Marine ecology** (Hedgpeth), 11.6–3; **"Albatross" (Swedish Deep Sea) Exped., 1947–1948** (Pettersson), 11.6–13; **Arctic Sea Ice Conf.**, 11.6–25; **Ocean propagation of microseisms** (Hieblot, Rocard), 11.6–167; **Wind speed determination at sea** (Brogmus), 11.6–307; **Nuclei and maritime air** (Brier, Kline), 11.6–323.

11.6–170 551.556.8:551.461.2

Franceschini, Guy A. (*Dept. of Oceanog. and Met., A & M College of Texas*), **Surface wind stress effects over waters southeast of Japan.** *Meteorological Society of Japan, Tokyo, 75th Anniversary Vol. of the Journal*, pub. Nov. **1957.** p. 140–143. 3 figs., 3 tables, 7 eqs. **DWB, DLC**—The effect of wind stress on the surface of the ocean in the region southeast of Japan is considered. Divergence of the mass transport due to the mean annual stress in this region is such that it favors alternating areas of upwelling and sinking. This may in part explain the existence of the semi-permanent cold and warm water areas around which the Kuroshio current flows. *Subject Headings:* **1. Wind stress 2. Wind effects on water surfaces 3. North Pacific** —*Author's abstract.*

11.6–171 551.556.8:551.461.2

Vines, R. G. (*Commonwealth Scien. & Indust. Res. Organiz., Melbourne, Australia*), **Wind stress on a water surface: measurements at low wind speeds with the aid of surface films.** *Royal Meteorological Society, Quarterly Journal*, 85(364):159–162, April **1959.** fig., table, 8 refs. **DWB, DLC**—A monolayer on a water surface is affected by the action of wind, and retracts until the wind drag is counter-balanced by the opposing surface pressure gradient. This effect has been used to determine the shearing stress on water at low wind speeds. Estimates of the drag coefficient have been obtained. *Subject Headings:* **1. Shear stress on water 2. Wind stress.**—*Author's abstract.*

11.6–172 551.543.3:532.59

Gião, Antonio, **Ondes de surface.** [Surface waves.] *Geofisica Pura e Applicata*, Rome, 37:237–267, **1957.** 2 figs., 113 eqs. French and English summaries p. 237. **DLC**—The aim of this paper is to give the proof of some new general properties of a class of functions (the surface waves) which is very important in physics and geophysics. We first give the proof of a fundamental theorem establishing the identity of the set of all surface waves and the set of functions for which, at any moment t_o and at any point A_o of their domain, there exists a proportionality between time intervals comprising t_o (asymmetrically, in the general case) and the radius of the circular domains centered on A_o, such that the corresponding temporal and spatial means are equal. This theorem allows to write in finite terms the solution of the partial differential equations of any surface wave. The general results are then applied: 1° to the diurnal pressure variation, showing that this phenomenon can be considered as a surface wave and giving the fundamental law $\cos^3 \varphi$ (φ latitude) for the amplitude of the progressive or travelling 12-hourly wave; 2° to the waves of the synoptic pressure variations. For these waves the relations between their characteristic parameters is first established and finally their theoretical spatial configuration or pattern is deduced. *Subject Headings:* **1. Surface waves 2. Pressure waves 3. Wave theory.**—*Author's abstract.*

11.6–173 551.556:532.59:551.46:551.35

Vollbrecht, Kurt, **Die Beziehungen zwischen Windrichtung und materialversetzender Wellenenergie.** [The relation between wind direction and material-displacing wave energy.] *Acta Hydrophysica*, Berlin, 4(1):49–65, **1957.** 6 figs., 12 refs., 4 eqs. **DLC**—Improved theoretical reasons are advanced accounting for the material-displacing effect of waves caused by winds directed under a small angle to the shore, parallel or even under a negative angle. The problem is solved in principle by assuming a statistical distribution of energy around the prevailing direction. *Subject Headings:* **1. Beach erosion 2. Wave energy.**—*A.A.*

11.6–174 551.46:551.506.22 551.46.018

Gougenheim, A. (*Service Hydrographique de la Marine, France*), **Les recherches océanographiques de l'Année Géophysique Internationale.** [Oceanographic researches of the International Geophysical Year.] *La Nature*, Paris, No. 3293:396–400, Sept. **1959.** 9 figs. **DLC**—A brief historical account and a summary of the oceanographic program of the IGY are presented. This program deals principally with marine circulation, wave- and swell measurements, bathymetric soundings, determination of carbon^{14} and tritium rates, radioactivity measurements of sediments, etc. A review is given of the part of each country and particularly that of France in the oceanographic program. The theoretical and practical interest of marine circulation is shown. The author gives the determination methods of currents and describes the new apparatus, their principal characteristics and working principle. He reviews the work of the IGY relating to: sea level fluctuations (seasonal and annual changes), sea level control description of apparatus, tidal waves, tidal oscillations), ordinary swells and very long period swell. *Subject Headings:* **1. IGY oceanographic program 2. Oceanographic research 3. Oceanographic instruments.**—*A.V.*

11.6–175 551.46.018 551.462

Wolff, Torben (*Univ. of Copenhagen*), **L'exploration des mers profondes.** [Exploration of deep seas.] *La Nature*, Paris, No. 3294:425–431, Oct. **1959.** 9 figs. **DLC**—Brief review of oceanographic instruments used during the last 100 yrs and of the expedition round the world of the British vessel "Challenger." The extreme depths attained during oceanographic soundings in the last years are summed up. Anchoring, measurement of currents and life in the greatest depths are treated. The results of explorations at great depths, carried out by several oceanographic vessels, are shown on diagrams. *Subject Headings:* **1. Oceanographic instruments 2. Oceanographic soundings.**—*A.V.*

11.6–176 551.511.3:551.461.2

Valembois, J. and Bonnefille, R., **Etude de l'action de la force de Coriolis sur la propagation des marées en fonction de l'étendue de la zone marine considérée.** [Investigation of the effect of the Coriolis force on the propagation of tides as a function of the size of the region under consideration.] *La Houille Blanche*, Grenoble, 14(5):568–585, Aug. **1959.** 24 figs. (French and English summaries. **DLC**—A rotating model which diagrammatically simulates a triangular sea with a sloping bed was constructed at the National Hydraulic Laboratory for the purpose of investigating the effect of the Coriolis force as a function of the size of the region simulated on the model. When the seabed is rough and its depth varies between zero and a few hundred meters, the effect of the Coriolis force is to deform the tide wave. This is still perceptible when one shore of the sea is 300 km long, but is negligible when this length is less than 150 km. However, a fundamental modification of the current field was noticed in connection with the direction of rotation of the velocity vector in space, this effect being independent of the size of the region under consideration. Similar experiments with a smooth seabed give rise to a standing wave which hides the effect of the Coriolis force. Here the current field differs very greatly from that encountered when the seabed is very rough. Consideration of the tide with different coefficients of friction shows that the variation of the current field is continuous and that it has as its main effect the reversal of the direction of rotation of the velocity vector. *Subject Headings:* **1. Ocean currents 2. Tidal propagation 3. Oceanographic research laboratories.**—*Authors' abstract.*

11.6–177 551.462

Zenkovich, V. P., **Sea bed.** Transl. from the Russian by I. Lasker. Moscow, Foreig Languages Pub. House, **1958.** 60 p. 35 figs. **DLC** (GC83.Z413)—A small pamphlet typ booklet covering the history and methods of exploring the bottom of the sea, the structure an composition of the sea bottom, the construction of the modern sonic depth finder, the botto sampling tube, the nature of the continental shelf, the continental slope, underwater canyons the rock formation of the ocean bed, coral islands, flat-topped banks, submarine ridges an troughs. Many schematic diagrams are included. Material is taken mainly from Sovie sources and is especially applicable to the regions around the U.S.S.R. (Arctic, Caspian East Asia, North Atlantic, etc.), although much world-wide information is included. *Subjec Headings:* **1. Marine geology 2. Ocean bottom 3. Bottom sampling 4. U.S.S.R. I. Lasker I.** (*transl.*).—*M.R.*

11.6–178 551.463

*Zubov, Nikolaĭ Nikolaevich and Sabinin, K. D., **Vychislenie uplotneniia pri smesheni morskikh vod.** [Calculation of the increase in density on mixing of sea waters.] Moscow Gidrometeoizdat., **1958.** 36 p. 8 figs., 16 tables, 31 eqs. **DLC** (GC151.Z8)—When two wate masses of differing temperature and salinity are mixed, the volume decreases and the density increases accordingly. This pamphlet goes into all of the theoretical and practical details o the processes involved, their measurement, and wind mixing, tidal mixing, density mixing horizontal and vertical mixing. The amount of increase in density depends on the difference of temperature and salinity of the two masses, but more on the temp. than on the salinity difference. With constitutional difference in temp. and salinity, the increase is greater the lower the temperature and salinity. Therefore, the process is more important in cold fresh water areas than in warm saline waters. Also the increase is greatest when the 2 volumes of water are nearly the same. The process facilitates downward mixing and slows down upward (vertical) mixing, and thus facilitates wind and density mixing and retards tidal mixing. It results in a lowering of sea level in frontal (convergence) zones, but this may be masked by other frontal processes and is, in fact, not measurable. Numerical and graphical examples are given. *Subject Headings:* **1. Sea water density increase during mixing 2. Mixing processes in sea water.**—*M.R.*

11.6–179 551.464:537.723

†*Sopach, E. D., **Elektroprovodnost' kak metod opredeleniia solenosti morskikh vod** [Electrical conductivity as a method of determining salinity of sea water.] Ed. by L. K. Blinov. Moscow, Gidrometeoizdat., **1958.** 138 p. 20 figs., 38+18 tables, 123 refs., 34 eqs. At head of title: Glavnoe upravlenie gidrometeorologicheskoĭ sluzhby pri Sovete Ministrov SSSR. Gosudarstvennyĭ okeanograficheskiĭ institut. **DLC** (GC121.S6)—A thorough and systematic treatise (in monograph form) on theoretical and experimental aspects of oceanographic salinity determination by electrical conductivity measurements. The four main headings cover: I. History; II. Theoretical basis for application to sea water in general and to Azov, Caspian, and Aral Seas, methods of calculating, etc.; III. Apparatus and experiments; and IV. Results, especially for Azov, Aral and Caspian Seas. Many graphs, nomograms, and tables are included, and an extensive bibliography and detailed tables for computations and especially actual analyzed data for the 3 inland seas, appended. The work is intended for hydrochemists and oceanographers as well as for specialists working in research on application of electrical measurements to sea water. *Subject Headings:* **1. Electrical conductivity of sea water 2. Salinity determinations by conductivity 3. Conductivity measurements of sea water. I. Blinov, L. K.** (*ed.*).—*M.R.*

11.6–180 551.464(265)

†*Akademiia Nauk SSSR. Institut Okeanologii, **Problemy khimii moria.** [Problems of the chemistry of the sea.] Its *Trudy*, Vol. 26, **1958.** 246 p. figs., charts, tables, bibliogs. **DWB** (P v. 26)—This substantial monograph contains 8 articles on chemistry of the sea by S. V. Bruevich, E. D. Zaĭtseva, O. B. Shishkina, N. D. Starikova and V. V. Mokievskaia. The subjects include: 1) general methodology of chemical oceanographic investigations; 2) the chemistry of the Bering Sea sediments, in detail; 3) the salt composition of interstitial waters

the Far East and N. W. Pacific adjacent to it; 4) cation capacity of marine sediments; 5) ganic carbon determination in interstitial waters; 6) phosphorus distribution in Far Eastern ters; 7) methods of silicon determination in sea water; 8) standardization of methods of emical analysis and reporting data from analyses of sea water. The articles are full of data, arts, curves, diagrams and references. *Subject Headings:* **1. Chemical analysis of sea water Chemical analysis of marine sediments. 3. Oceanographic chemistry data 4. East Asia rdering seas 5. Bering Sea.**—*M.R.*

11.6–181 551.556.8:532.593:551.465

Schooley, Allen H. (*U. S. Naval Res. Lab., Wash., D. C.*), **Profiles of wind-created water aves in the capillary-gravity transition region.** *Journal of Marine Research*, New Haven, nn., 16(2):100–108, Aug. **1958.** 10 figs., 3 refs. **DWB, DLC**—Crapper (1957) has theo- tically predicted that pure capillary waves have profiles that peak downward, which is the verse of the gravity wave case. This paper confirms Crapper's theory and shows enlarged ofiles of capillary waves that were photographed with a high-speed motion picture camera a small water-wind tunnel. Under the conditions of measurements, the maximum vertical stance between trough and crest for the capillary waves observed was about 0.5 wavelength. his is roughly 70% of Crapper's theoretical figure of 0.73 and is about 3.5 times the maximum 0.14 for gravity waves. Wave profile pictures in the transition region capillary to gravity aves are also shown. Examples are given where capillary waves having the same velocity s the gravity waves tend to ride just in front of the start of the crests of gravity waves. *Sub- ct Heading:* **1. Wind wave profiles.**—*Author's abstract.*

11.6–182 551.556.8:551.465:532.593

Chigirinskiĭ, P. F., **Ob uchete vliianiia podvetrennogo berega na vysotu volny.** [Com- utations of the influence of the leeward shore on wave height.] *Meteorologiia i Gidrologiia*, eningrad, N. 4:46–47, April **1959.** 1 fig., table, 2 refs., eq. **DWB, DLC**—An example is ted from the Volgar water reservoir showing that the leeward shore diminishes considerably ne wave height. A method is presented for expressing quantitatively the influence of shores pon wind waves. The variation in wind velocity along a profile in the zone of a leeward nore is considered analogous to the dependence of the variation of wind velocity in a wind elter zone of a dense forest belt. In the determination of wind velocity on a leeward shore n the basis of wind shelter belt data obtained by Ia. D. Panfilov, the following conditions ere assumed: 1) the velocity of the wind and steppe corresponds to the velocity over an open ater surface, and the law of the variation of wind velocity near a dense forest zone from the eward side corresponds to the law of variation of wind velocity on a leeward shore. 2.) s a result of the fact that the forest zone represents a vertical wall while the shore is usually nclined, the wind velocity immediately behind forest belts may be equal to zero while at the oast line it may be close to the wind velocity over the open water. In applying the method f Panfilov, the determination of wind velocity at any point was carried out not from the ntersection with the water but from the point of intersection of the perpendicular from the dge of the slope to the plane of the horizon. The formula for computing the leeward wind s given by $V_x = V_o a/100$ where V_x = wind velocity on the leeward shore at the distance x rom the edge of a slope; V_o = wind velocity over an open surface where the slope exerts no nfluence; a = wind velocity at the leeward shore at the distance x from the edge of the slope xpressed in per cent velocity over an open water surface; values of a are given in a table and he computation of wave heights is outlined. *Subject Headings:* **1. Wind waves 2. Coastal ffects on waves.**—*I.L.D.*

11.6–183 551.501:551.465

Timonov, V. V. and Soskin, I. M. (*ed.*), **Sbornik rabot po metodike izucheniia morskikh echeniĭ i prilivnykh iavleniĭ.** [Collection of papers on methods of investigating ocean cur- ents and tidal phenomena.] *Moscow. Gosudarstvennyĭ Okeanograficheskiĭ Institut, Trudy*, No. 30(42), **1955.** 289 p. figs., tables, refs., eqs. For listing of these articles *see* Pt. III, p. 629, April 1960, *Met. Abstracts.* (These articles not abstracted separately.) **DLC** GC1.M58)—A major collection of 22 articles on methods used by the Hydrometeorological ervice of the U.S.S.R. to measure and study currents and tidal phenomena. The articles

(after an introductory article) are divided into 3 major sections: 1) organizing and carryi out hydrographic work at sea, 2) methods of working up observations, and 3) methods analyzing data and describing the phenomena which are being studied. All manner of equ ment for measuring currents and tides, including navigational methods, logs, anchored shi stationary, floating or submerged buoys or gages and floating, automatic stations, geoelect magnetic equipment and techniques, automatic computers, harmonic analysis, accuracy methods, including the effects of wind drift of boats, etc. are considered. Astronomical aspec compilation and use of atlases of currents, etc. are described and illustrated with photograp schematic diagrams, scatter diagrams, records, nomograms, charts, data tables, etc. Actu application to the Baltic are considered. *Subject Headings:* **1. Current and tidal measureme techniques 2. Tidal current instruments 3. U.S.S.R.**—*M.R.*

11.6–184 551.556.8:551.465(262.

Bogdanova, A. K. and Kropachev, L. N., **Sgonno-nagonnaia tsirkuliatsiia i ee rol' gidrologicheskom rezhime Chernogo moria.** [Onshore-offshore circulation and its role in t hydrological regime of the Black Sea.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:26–3 April **1959.** 3 figs., 18 refs. **DWB, DLC**—The onshore-offshore currents of water along t Soviet shores of the Black Sea, a particular offshore current observed along the coast fro Odessa to Batum during August 1947 including the characteristic southwest and west win at the northwest and north shores, and the water temperature at varying depths and an o shore current observed from Odessa to Sochi from June 6 to July 6, 1949 are described. T examples confirm the extension of offshore currents along the entire coast of the Black S during the origin of circular currents with an anticyclonic rotation system and indicate t high stability and great duration of their existence. Their greatest duration is usually at t end of spring when the spur of the Siberian anticyclone weakens and is displaced eastwar and Mediterranean cyclones obtain free access across the Black Sea to the south of Europe U.S.S.R. Between 1916 and 1940, and 1946 and 1956, 3 to 4 extensive and long lasting o shore currents embracing a considerable part of the coast were observed on the average of eve summer. Owing to the very high frequency of northeast and east winds over northern coas and southwest and west winds over the Anatolian coasts, a cyclonic system of winds wi onshore currents prevails in the Black Sea along the coasts. The offshore transverse circul tion of waters forms a cauldron-shaped structure of iso-surfaces as a result of the distributi of warm surface waters and cold deep waters. During intense offshore currents, waters deeper layers emerge at the dryer shores with temperatures of colder layers laying in the Bla Sea at a depth of 50–75 m. At the same time warmer surface water layers are driven fro the shores into the sea for tens of kilometers. Observations on offshore and onshore curren in the Black Sea showed that during a current velocity of 40–60 cm/sec the magnitude components on the sea surface fluctuate between 3 and 10 cm/sec. Normal current compone on the bottom layer has direction opposite the surface layer: during onshore it is towards t sea, offshore it is towards the coast. The transverse offshore-onshore circulation in the Bla Sea does not include in a single ring the entire layer of water from surface to bottom but consis of layers and subsides with depth from layer to layer. The temperature and salinity characte istics of the onshore-offshore circulation, the oxygen characteristics, ascent and descent water in the centers of cyclonic and anticylonic current, values of seasonal characteristics the circulation, etc. are discussed. *Subject Headings:* **1. Tidal circulation 2. Coastal curren 3. Wind driven currents 4. Black Sea.**—*I.L.D.*

11.6–185 551.556.8:551.465:576.8(428.2)(210.

Evans, Frank (*Dove Marine Lab. Cullercoats*), **Wind currents, tidal streams and plankt off the Northumberland coast.** *Marine Biological Association of the United Kingdom, Plymou Journal*, 38(3):529–541, **1959.** 7 figs., 8 tables, 8 refs. **DLC**—Using free drogues, observatio have been made of the wind currents and tidal streams at three depths off the Northumberla coast. Records of current speed and direction for the near-surface, mid-water and nea bottom levels are given, together with tidal stream ranges. A relationship is established b tween wind current and wind, and between stream range and tidal range. Using pairs drogues, the characteristics of oceanic turbulence over a short period were investigated. T relationship of all these factors to plankton patchiness is considered. *Subject Heading*

Wind driven currents 2. Tidal currents 3. Plankton—current relationships.—*Author's summary.*

11.6–186 551.511.3:551.465

Saint-Guily, B., **Influence de la force de Coriolis dans la dynamique des mers.** [The influence of Coriolis force on sea currents.] *La Houille Blanche*, Grenoble, 14(5):556–559, Fig. **1959.** French and English summaries p. 556. **DLC**—Investigations based on the theory of Bjerknes and Helland-Hansen and on the theory of Ekman, show the great part played by Coriolis forces on ocean currents. Generally speaking, a consideration of several dimensionless quantities makes it possible to estimate the relative magnitude of the various terms in the hydrodynamic equations. Several worked examples bring out the magnitude of the effect of Coriolis forces on ocean currents. The method is not as rigorous as integration of the complete equations. *Subject Headings:* **1. Hydrodynamics 2. Ocean currents 3. Coriolis force.**—*Author's abstract.*

11.6–187 556:551.461.2

*Lisitzin, Eugenie (*Inst. of Marine Res., Helsinki*), **Determination of the slope of the water surface in the Gulf of Finland.** *Geophysica*, Helsinki, 5(4):193–202, **1958.** 3 figs., 10 tables, refs., eqs. **DWB, DLC**—Data show that salinity or density affects the water level of the Baltic very little, air pressure differences (Helsinki-Mariehamn) considerably, and the wind direction and speed most of all. A number of tables show the seasonal effects between various stations along the Gulf of Finland which is an ENE extension of the Baltic and hence easily affected by the prevailing WSW and ENE winds. The slope of the water surface as determined by density measurements at 10 m depth, pressure and wind data as compared with actual hydrographic (sea level) measurements at several pairs of points, and agreement shown graphically. *Subject Headings:* **1. Water surface slope 2. Wind effects on water surface slope 3. Gulf of Finland.**—*M.R.*

11.6–188 551.465:551.556.8

†Weenink, M. P. H., **A theory and method of calculation of wind effects on sea levels in a partly-enclosed sea, with special application to the southern coast of the North Sea.** *Netherlands. Meteorologisch Instituut, Mededelingen en Verhandelingen*, [*Ser.* A], No. 73, **1958.** 1 p. figs., tables, 75 refs., eqs. **DLC**—This publication deals with the theoretical development of an equilibrium method of computing the effect of wind on sea levels in a shallow, partly-enclosed sea. The basis of this method was laid by W. F. Schalkwijk. In this study it is extended to several places of the Netherlands coast and it is developed in such a way that inhomogeneities of the wind field over the southern half of the North Sea are now taken into account, this field being divided into three sub-fields. The equilibrium effect is found to be the sum of (1) a part depending on the wind stress field only (static effect) and (2) a part depending on the current field (current effect). It may easily be seen that the current transport is composed of three components: a wind vorticity current, a bottom slope current and a leak current. Correspondingly, the current effect is composed of a wind vorticity effect, a bottom slope effect and a leak effect. In applying this theory to the North Sea, the wind field acting upon the water may be schematized into a pattern of sub-fields, each of which has a uniform wind. Since the equations involved are linear, the wind effect at a particular place may be considered as being built up from the contributions of the sub-fields, taken separately. This mathematical model has three parameters that have to be determined empirically, viz. (a) the proportionality factor linking the bottom friction stress to the current transport, (b) the leak parameter linking the leak effect to the sum of the other effects, and (c) the drag coefficient linking the wind stress to the square of the gradient wind velocity, this parameter being supposed to be a climatological function of wind direction. If, then, a quantitative relation between the wind over the sea under consideration and the wind effect at one particular place has been determined empirically, the above parameters may be computed by means of the method of least squares, and formulas for the equilibrium wind effect at any other place of the coast may be computed. *Subject Headings:* **1. Wind effects on sea level 2. Wind stress 3. North Sea.**—*From author's summary.*

11.6–189 525.63:551.509.

Sager, Günther, **Gezeitenvoraussagen und Gezeitenrechenmaschinen.** [Tide predict and tide calculating machines.] Warnemünde, **1955.** 126 p. 26 figs. (incl. photos and map tables, 13 refs. At head of t-p.: Deutsche Demokratische Republik, Seehydrographisc Dienst, Hydrometeorologisches Institut. **DLC** (GC306.S3)—The history of tidal observat from the Greek era, of tidal theory from GALILEO and KEPLER (1571–1630), of tidal predict from the tables by FLAMSTEED (1646–1719), in the **Philosophical transactions** of LORD KEL (first model 1872) to that of FERREL in the U.S. in 1882 and the more recent British, Germ (1916, 1939 and 1955), Japanese (1914, and 1924), Argentinian (1918, 1952), French (188 Portuguese (1924), Soviet (1945), Norwegian (1947), Spanish (1948), Philippine (195 and Siamese (1951) models. Many of these models, both early and recent, are described a illustrated in detail, the theory is outlined, tables given, and special attention given to the n machine of the DDR built in 1952–1954. *Subject Headings:* **1. Prediction of tide theory Tide forecasting machines 3. East Germany. I. Oehmisch, Wilhelm II. Miehlke, Otto** *M.R.*

11.6–190 539.16:551.3.0

Sastry, A. V. R. and Mahadevan, C. (*both, Dept. of Geology, Andhra Univ., Waltai*) **Radioactivity of sea-floor sediments off Visakhapatnam.** *Journal of Scientific and Industr Research, Sec.* B, New Delhi, 16(10):429–431, Oct. **1957.** 2 figs., 3 tables, 5 refs. **DW DLC**—This report is a review of the preliminary exploratory work that was done on the d tribution of radioactivity of sea floor sediments by MAHADEVAN and ASWATHANARAZANA the east coast of India. The previous reports are found in volume one of the *Andhra Univers Mem. Oceanogr.* (**1954**), p. 27 and 36, and in the *Journal of Scientific and Industrial Researc Sec. B* (**1954**) p. 88. The results and discussions are similar, and an inference is made that t large carbonate content in the representative sea floor sediments in this experiment correspon to low radioactivity of the sediments. The data used for this research also support the earl investigations on the zonal distribution of these sediments. *Subject Headings:* **1. Radioacti sea bottom sediments 2. Visakhapatnam, India.**—*N.N.*

2. HYDROLOGY

See also: **Water resources development** (Ackerman, Löf), 11.6–4; **Water balance-civil engineering relationships** (van Himbeeck), 11.6–344.

11.6–191 551.506:518.5:628.1(79

California. Dept. of Water Resources, **Report on observation and processing of bas water resource data in California.** Feb. **1959.** 91 p. chart (fold.) **DWB** (M79 C153re) The report intends to present descriptions of the basic water resource data program of t various agencies operating in California and to indicate the extent and type of their cooperati with the State Department of Water Resources. It also describes the extent and scope of t present data collection programs in California. Third, it evaluates to what extent the prese programs should be expanded and defines the responsibilities of the State for needed expansio in the programs. The report is organized in three parts. Ch. I summarizes statements of t problems of water resource data collection and submits premises and axioms considered func mental to the responsibilities and activities of the Department of Water Resources in this fie Ch. II describes the basic data activities of each major agency in the field of water. Ch. I presents general recommendations regarding future activities and expansions of the basic wa resource data programs. The appendix table entitled "Classes, Sources, and Uses of Ba Water Resource Data in California", lists the principal interests of many federal, state, a local agencies in each of the numerous classes of data related to water resources in Californ *Subject Headings:* **1. Water resource data program 2. California.**—*I.S.*

11.6–192 551.579:06

Gilead, M., **The rôle of WMO in hydrology.** *World Meteorological Organization, WM Bulletin*, 7(4):162–164, Oct. **1958. DWB**—If WMO accepts responsibility for hydrolo budget requirements must be adjusted to meet the increased activity. Also, the probl

representation will be complicated, as there will be a question as to whether a meteorologist a hydrologist would represent a small country. Expanding of meteorological interests is e prime concern of WMO. *Subject Headings:* **1. WMO hydrological role 2. Hydrological ta control.**—*M.R.*

11.6–193 551.579(02)

*†Andreianov, Vladimir Georgievich, **Gidrologicheskie raschety pri proektirovanii malykh srednikh gidroelektrostantsiĭ.** [Hydrological computations in planning small and medium ed hydroelectric stations.] Leningrad, Gidrometeoizdat., **1957.** 522 p. 141 figs. (incl. merous maps), 2 maps (col., fold. in pocket), 33 refs., 135 tables+tables in appendix, eqs. LC (GB746.A7). Review by R. L. Kreps in *Meteorologiia i Gidrologiia*, Leningrad, No. 3:56–, March **1959.**—A large and detailed volume devoted to the hydrology of the small and edium sized rivers of the U.S.S.R. and to methods of hydrological analysis and computation r small and medium sized hydroelectric stations. Includes probability curves and other atistical tools, methods of observation and reporting, annual and seasonal variations in runoff, w water runoff, flood runoff, other calculations affecting hydroelectrical construction (regula- on, evaporation, wind, ice and tidal variations, bed-load, silting, flood hydrographs), and many eful computation tables, graphs, charts, nomograms, maps, etc. (large colored maps of an- ial runoff in European and in all of the U.S.S.R., 1946). *Subject Headings:* **1. Hydro- chnical computations 2. Runoff in U.S.S.R. 3. Hydrology textbooks 4. Small river hy- ology 5. U.S.S.R.**—*M.R.*

11.6–194 551.579.2:551.509.329:627.8(282.243)

Frohnholzer, Josef, **Die Zuflussvorhersage aus Schneegewichtsbestimmungen für den echspeicher Rosshaupten von April bis Juli (Einzugsgebiet 1582 km²).** [Predicting the flow the Rosshaupten reservoir on the Lech River from April to July on the basis of snow weight easurements.] *Germany. Deutscher Wetterdienst, Berichte,* 8(54): 157–162, **1959.** 7 figs., tables. German, English and French summaries p. 157. **DWB, DLC**—In Jan. 1958, for ie first time, monthly determinations of the snow-weight at 45 places were made to find out ie water content. Calculation was made of the snow-water-supply for April 1, 1958 with 25 × 10^6 m^3 gross. Reactive until 1946 studies of the relation monthly rainfall minus monthly unoff-water were made by hydrographic datas. Hereby, transformation of snow into water s an additional spring runoff and preparation of "Regressions-equations" for the water supply recast of 1958 on the basis of the net water supply of 425 × 10^6 m^3. There are no criteria for ie taxation of the part of losses. An important fact is an exact determination of the rhythm freezing limits during thawing off. No data are known about this rhythm within a multi- rmed mountain relief, up to a height of 3000 m. A telethermometer, with a telesnow-gage at "representative" place, could deliver analogous actual test results as tele water gages of odern outfitted river areas. From snow gage of the Zugspitzplatt, characteristics of the run- ff tendencies within the Lech area could be determined. *Subject Headings:* **1. Snow-water stimation 2. Water supply forecasting 3. Reservoirs 4. Lech River, Germany.**—*Author's bstract.*

11.6–195 551.579.2/4 551.578.46

Pardé, Maurice, **Sur les fontes des neiges lors des crues. La grande crue alpestre de juin 957.** [Thawing of snow at the time of floods: the great Alpine flood of June 1957.] *Revue de 'éographie Alpine,* Grenoble, 67(3):325–361, **1959.** fig. refs., **DWB, DLC**—Study of the ole of snow melting in floods. After some general reflections (meteorological conditions and ow) on the Alpine flood during June 1957, author investigates the probable peak flows recorded n this region during the melting of the snow. In Pt. 2, he considers the floods due, either solely r considerably, to hot weather. For this purpose, the author considers successively the floods f the Alpine, North-American and Soviet rivers. He examines the role of the thawing of ow at the moment of certain severe Alpine and mainly pluvial floods. It is shown that the elting of the snow generally plays only a secondary role in floods. The liquid precipitations ay account for the great floods in the low countries at middle latitudes. The thawing of snow not sufficient to cause by itself very severe floods. In certain favorable conditions (thick ow cover, pronounced rise in temperature, together with rainfall), it happens that snow sup-

plies $\frac{1}{5}$, $\frac{1}{4}$ and sometimes $\frac{1}{2}$ of the total volume drained off in several days. Attention is dr on the importance of snow retention, which reduces floods whereas melting aggravates th As a result of the differences in temperatures, melting does not appear everywhere at the s time. One can see how a numerical diversity characterizes the role of snow in floods, accor to the great terrestrial zones or to more restricted areas, and what forces the one favorable, other harmful, retention and melting of snow can start. *Subject Headings:* **1. Flood stu 2. Snow melt effects on floods 3. Snow retention.**—*A.V.*

11.6–196 551.579.4:551.482(23

Kemmerikh, A. O., **Stok rek Severnogo, Pripoliarnogo i Poliarnogo Urala.** [Runoff in rivers of the northern, sub-Polar and Polar Urals.] *Akademiia Nauk SSSR, Izvestiia, Geograf.*, No. 1:85–90, Jan./Feb. **1959.** 2 figs., 4 refs. **DWB**—The climate of the north sub-Polar and Polar Urals is determined by its high latitude position, the meridional direct of the Urals and by the orography and absolute elevation of the area. The winter seaso 6–7 months duration in the lowlands and 7–8 months in the mountains. The temperat is characterized by stable frost with Jan. means from −23° to −25°C; relatively warm short summers with July temperatures of 13–17°C. Precipitation is distributed unequa The snow cover becomes established in the mountains in Sept.–Oct. and in the plains in O Nov. Snow melt begins in April–May in the plains and May-June in the mountains. river network is well-developed, especially on the western slope of the sub-Polar Urals wh it reaches 400–450 met/km² of the area of the basin. The number of lakes is very la especially in the cis-Ural zone of the eastern slopes of the sub-Polar and Polar Urals. On basis of the relationship between mean long period annual runoff and mean height of the ba there were established four regions with individual river basins. At relatively small m elevations of the water basins, the variation of runoff with height is a straight line. A m for the mean annual runoff of the rivers of this region constructed on the basis of the relati ship between runoff and elevation is presented and the runoff in this region is discussed. *S ject Headings:* **1. River basin studies 2. Runoff maps 3. Ural mountains 4. Soviet Arctic** *I.L.D.*

11.6–197 551.579.4:551.482(497

*Khitrov, G., **Belezhki vŭrkhu tsentŭra na tezhestta na vodosbornata oblast.** [No on the center of gravity of a drainage area.] *Khidrologiia i Meteorologiia*, Sofia, No. 3:52– **1959.** 5 figs., 10 tables, 2 refs., 9 eqs. Russian and English summaries p. 66–67. **DLC** An attempt is made to draw maps of runoff (Yantra River), taking into consideration irregularity of its distribution. Critical notes are made concerning the geometrical center gravity of the catchment area, which is accepted as a basis at present. From a detailed me orological and hydrological survey of the drainage basin from the Yantra to the Cholakotv Rivers, the author arrives at the following conclusions: 1) it is suggested that the aver altitude above sea level be used as a basis when ignoring the irregularity in the distribution runoff; 2) it is suggested that the center of gravity of runoff be used when taking into conside tion the irregularity. The graphostatic method is used. The problem of determining supp mentary runoff is also solved. *Subject Headings:* **1. Runoff maps 2. River runoff distribut 3. Bulgaria.**—*Author's abstract.*

11.6–198 551.579.4:551.4

Klueva, K. A., **K voprosu o vliianii osushcniia bolot na rechnoĭ stok.** [The probl of the influence of marsh drainage on river runoff.] *Meteorologiia i Gidrologiia*, Leningr 6:17–20, June **1959.** table. **DWB, DLC**—The effect of the drainage of marshes upon water flow of rivers in Poles'ia, White Russia, was investigated by means of a detailed analy of the data of the drained basin of Oressa River (tributary of the Pticha-Pripiota River) the Andreevka water gaging station during the periods before and after drainage operatic A detailed account is given of the observations on river flow during the period of operatic which extended from 1925–1926 to 1938–1939, and data on the rate of seasonal flow of Ore River at Andreevka to the total flow in its catchment basin for each succeeding year are p sented in a table. An analysis of the data of annual flow showed that drainage did not influe perceptibly the total annual water content of the river. There is a seasonal equalizatio

distribution of the waters as a result of drainage. *Subject Headings:* **1. River flow 2. noff estimation 3. Drainage effects on runoff.**—*I.L.D.*

11.6–199 551.579.4(243.3) 551.579.2:551.524.31

Poggi, André, **La fusion de la neige et les crues de juin 1957 dans les Alpes Françaises ientales.** [The melting of snow and the floods of June 1957, in the Eastern French Alps.] *vue de Géographie Alpine*, Grenoble, 67(3):363–374, **1959.** 6 refs. **DWB, DLC**—Review some formulas expressing the melting of snow in consideration of the mean diurnal tempera- re. Applied to the flood of June 1957 in the Eastern French Alps, these formulas have helped npute the fusion owed only to the heat exchanges between snow and air. Taking into count the melting resulting from heat arising from precipitation, the author deems that at e periods when melting is the most intense, the maximum water waves should be in the range 60 mm on 24 hrs, and water waves of 80 mm on 24 hrs constitute a superior limit. *Subject adings:* **1. Snow melting 2. Snow melt—mean diurnal temperature relationships 3. oods 4. Eastern French Alps.**—*A.V.*

11.6–200 551.579.4(87) 551.577.37

*Wiese, Robert S. (*U. S. Corps of Engineers. Los Angeles District Office*), **Hidrologia para canalizacion del Rio Guaire.** [Hydrology for the channeling of the Guaire River.] *Colegio Ingenieros de Venezuela, Caracas, Revista*, No. 277:5–43, April **1959.** 45 figs., 10 tables. **WB**—Monthly rainfall histograms are shown for Cagigal and Los Teques (typical stations the region of the flood-control canal project for protection of Caracas Valley), and mean nual and maximum daily isohyets are shown for the area. Annual variation in rainfall from 91–1958 with 10 yr running means are also shown on a graph, and a curve showing mean nual and maximum daily rainfall, one showing storm isohyets for 18–19 June 1951 and Aug. , 1958, Feb. 15–17, 1951, May 5–6, 1952, Dec. 4–5, 1956, June 9–10, 1958 and Oct. 3–4, 1951, th depth-duration frequency and mass rainfall curves for each, and a discussion of the drology and the flood hydrographs accompanying the charts. Composite curves are also awn for periods of ½–3 hours and rainfall frequency for 5–100 yrs, based on maximum storms idied. Data are also presented in tables. *Subject Headings:* **1. Storm rainfall studies 2. oods in Venezuela 3. Rainfall-depth-duration data 4. Rainfall intensity curves 5. Guaire ver, Venezuela.**—*M.R.*

11.6–201 551.579.5:551.584.3(762)

Krumbach, A. W., Jr. (*Vicksburg Res. Center, Forest Serv., U. S. Dept. of Agriculture*), **ffects of microrelief on distribution of soil moisture and bulk density.** *Journal of Geophysical esearch*, Wash., D. C., 64(10):1587–1590, Oct. **1959.** 3 figs., 5 tables, 2 refs. **DLC**—A plot moderately dissected bottom land soil in west-central Mississippi was divided into 120 mpling areas, on each of which soil moisture samples were taken from the 6- to 12-inch layer low the surface (at the point of sampling). Topography was mapped at contour intervals 0.3 ft and soil moisture and bulk density were analyzed in relation to microelevation. The tal differences of elevation on the plot was 1.8 ft. Two shallow drainages divided the plot. ery small changes in elevation caused significant changes in moisture and bulk density for the to 12-in. layer. The variation in moisture appeared to be greater when measurements were volume than by weight. *Subject Headings:* **1. Topographic effects on soil moisture 2. Soil oisture studies 3. Mississippi.**—*Author's abstract.*

11.6–202 551.508.99 551.577:551.579.5

Lawes, D. A., **Rainfall and percolation studies at Samaru.** [In: West African Cotton esearch Conference, Samaru, N. Nigeria, Nov. 18–23, 1957, **Proceedings** issued **1959.** p.193–06. fig., table, 3 refs. Pub. by Ministry of Agriculture Samaru, Zaria, and printed by askiya Corporation Saria, N. Nigeria. **DWB, DLC**—Data from the series of percolation ges installed at Samaru on soils with different surface treatments and coverage are presented r the rainfall season 1957 and compared with previous records. The effect of rainfall intensity d rates of percolation are also discussed. The calculation technique of percolation rates in ches/hr of different surface treatments at the peak of storms is graphically presented. *Sub-*

ject Headings: **1. Lysimeter data 2. Rainfall—percolation relationships 3. Samaru, Nigeria.**—*A. V.*

11.6–203 551.57

Lewis, G. C.; Jordan, J. V. and Fosberg, M. A., **Tracing moisture movement in slick s soils with radiosulfur, Pt. 2.** *Soil Science Society of America, Proceedings*, 23(3):206–2 May/June **1959.** fig., 7 tables, 13 refs. **DWB, DA**—A study was made of the pattern moisture movement in slick spot and associated soils. Field experiments to trace moist movement in slick spot soils were run on rangeland south of Boise and on irrigated land on Black Canyon tract near Caldwell. Radiosulfur in the form of dilute sulfuric acid was sorbed by a wad of cotton. Each wad was specifically placed at a different depth in or adjac to a slick spot. After several months, soil and plant samples from the areas indicated t characteristic patterns of moisture movement had occurred. On the tagged slick spots in rangeland, the greatest concentration of activity, hence the least moisture movement, was the B_{2t} and B_{3sa} horizons, the zones of maximum clay and salt accumulation, respective When the S^{35} was placed in the C_{ca} horizon, the activity moved upward into the B_{3sa} and horizons, indicating the upward movement of moisture. When the tracer was placed in A_p, top of the B_2, or in the B_3 horizon at the edge of the slick spot in the irrigated soils, th was movement downward and concentration in the C horizon. There was more concentrat of activity in the direction toward the slick spot than away. Plants growing in the direct of the slick spot contained more radiosulfur than those growing in the direction away from spot. The pattern of moisture movement in the associated soils, both in the rangeland a irrigated soils, was in all directions from the placements and had a low index value, indicat free movement of moisture throughout the profile. *Subject Headings:* **1. Soil moisture mo ment 2. Radioactive tracer techniques 3. Soil moisture effects on plant growth.**—*Autho abstract.*

11.6–204 551.579.5:551.52

van Eimern, J., **Beobachtungen und Bemerkungen zur Wasserbewegung im Boden u zur Frosthebung des Bodens.** [Observations and remarks on the water movement in the s and on soil heaving by frost.] *Zeitschrift für Acker und Pflanzenbau*, Berlin, 108(3):375–3 **1959.** 2 figs., 2 tables, 10 refs. **DLC**—The heaving of the upper surface of the soil un influence of frost was continuously recorded during the winter 1957–1958. The soil heavi followed immediately the appearance of frost, the highest value recorded being 23 mm. R ords show that the surface of the soil was in movement during the whole period of observatio Such heavings were also observed under certain conditions of temperature and humidity dur summer. The movement of water in the soil up to the surface cannot be explained by cap larity or condensation on the cold part of the soil; further studies are required on this subje *Subject Headings:* **1. Water movement in frozen soil 2. Frozen soil.**—*A. V.*

3. GLACIOLOGY AND ICE

See also: **Glacier variation—jet stream relationships** (Yamamoto), 11.6–271; **Temp.—glacier relationships** (Holzapfel), 11.6–295.

11.6–205 551.322:551.324.24:53

Vialov, S. S., **Regularities of glacial shields movement and the theory of plastic visc flow.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Se 1958.** pub. Gentbrugge, **1958.** p. 266–275. 6 figs., 17 eqs) **DWB** (551.311 I611sy)— theory on the movement of ice sheets is proposed, based on experimental and field studies dur the 2d Soviet Antarctic Expedition in 1957–58, data of other investigators, and the laws viscoplastic flow. The principle of the theory is that the flow of ice begins even under smallest stresses, not exceeding 1 kg/sq cm (as shown by studies in the Antarctic) and is anomalous viscous flow. As soon as a certain stress limit is exceeded, plastic deformati occur, which are accompanied by block sliding. The relation between stress and flow velo appears to be exponential and not linear. The stress velocity curve shows a discontinuity soon as a critical stress is reached, indicating that the deformation process passes throug

ages: slow movement approaching Newton's flow, and sharply increased flow under the nallest increase in stress. The discontinuity may be considered as a conventional yield point. t stresses less than the yield point ice crystal disintegration and reorientation occur, while greater stresses sliding takes place accompanied by the fragmentation and rotation of rystals. Differential equations are derived for the dynamic equilibrium of an ice sheet under arying conditions and its flow velocity. *Subject Headings:* **1. Glacier ice plasticity 2. lacier velocities.**—*SIPRE abstract.*

11.6–206 551.322:539.3:551.324.6

Vialov, S. S., **Regularities of ice deformation.** (In: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 383–391. 5 gs., 5 eqs.) **DWB** (551.311 I611sy)—Research conducted by the glaciological party of the d Soviet Complex Antarctic Expedition in an undersnow laboratory is described, and the reliminary results of ice deformation and flow tests are analyzed theoretically. The tests ncluded: compression tests on specimens confined laterally to simulate subsidence; compres- ion tests on specimens free to expand laterally, simulating ice flow under its own weight; the isplacement of ice under plane-parallel deformation; shearing tests under the action of tan- ential and normal stresses; and hardness tests. Data are graphed on the observed and alculated compression of ice with time, ice creep vs. time, the creep of ice along basal surfaces, he creep of ice of random structure, the creep of ice at different crystal orientations relative o the axis of loading, the deformation of ice under increasing stresses, and the relation between oading and flow speed. *Subject Heading:* **1. Ice mechanics.**—*SIPRE abstract.*

11.6–207 551.324(44)

Lliboutry, L., **Etude préliminaire du Glacier de Saint-Sorlin (Alpes Françaises).** [Pre- iminary studies of the Saint-Sorlin Glacier (French Alps)], (In: I.U.G.G. Association of Scien- ific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 45–55. figs., tables, 5 refs. French summary p. 45.) **DWB** (551.311 I611sy)—The results of studies n 1957 on the recession, movement, and structure of the ice are reported. The largest portion of the glacier consists of a gently sloping sheet of ice 1 km wide and 100 m thick. The main ice tream has receded 400 m since 1905, while the secondary stream has disappeared after a ecession of 350 m. The ice surface in the flat portion of the glacier has subsided 15 m on the ight bank, 30 m on the left, and 74 m at the front, while it has risen 5–15 m on the lower slope. A slight depression in the central portion of the glacier resulting from differential subsidence nd surrounded by subvertical shear fissures, probably corresponds to the limit of the sliding one. The glacier is nearly stagnant, except for a stream of active ice along its axis. The surface displacement of ice in the active zone ranged from 0.15–1.18 m toward the E and 0.25–2.59 m toward the N from June 20–Aug. 5, 1957. The highest values were recorded at the axis and decreased laterally. Shear crevasses and fissures at the W margin of the active ice tream were found to rotate as a result of differential movement, and close, while new, properly riented crevasses appeared. The state and texture of the ice in the ablation zone are described. *Subject Headings:* **1. Glaciers 2. Saint-Sorlin Glacier, France.**—*SIPRE abstract.*

11.6–208 551.324.51

Agostinelli, Cataldo, **Sul movimento di un ghiacciaio.** [Glacier movement.] (In: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 276–286. fig., 42 eqs. French summary p. 276). **DWB** (551.311 I611sy)—The movement of a glacier in a cylindrical channel is analyzed mathematically on the basis of SOMIGLIANA's theory, assuming that tangential stresses at the contact between ice and the channel walls are determined by Coulomb's law of dynamic friction with a friction coefficient varying with depth. A differential equation is derived for the profile of a normal section using the principle of least resistance, and the determination of velocities at each point in this section is reduced to the solution of the Neumann problem. The equation is simplified by neglecting the friction coefficient and making certain assumptions. The simplified equation is used to directly determine the maximum glacier depth from surface-velocity data, the form of the profile, and the friction coefficient at various depths. When surface velocity varies parabolically, the equation is integrated in finite terms and the resulting profile of the given

section assumes the form of a symmetrical parabolic arc. The isotachs appear as homofoc ellipses; ice velocity along the channel walls increases with depth; and the friction coefficie decreases with depth. *Subject Heading:* **1. Glacier velocities.**—*SIPRE abstract.*

11.6–209 551.324.

Glen, J. W. (*Physics Dept., Birmingham Univ., England*), **The flow law of ice: a discussio of the assumptions made in glacier theory, their experimental foundations and consequence** (In: I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 195** pub. Gentbrugge, **1958.** p. 171–183. 3 figs., 15 refs., 9 eqs.) **DWB** (551.311 I611sy)- Experimental evidence on the flow law of ice is reviewed, and the justification for various a sumptions commonly made in theoretical studies of ice movement is discussed. The theoretic possibilities of the flow law are examined, assuming that the ice consisted originally of random oriented polycrystals, that the rate of flow depends only on stress and not on the time it ha been active, and that the density of ice remains constant during flow. STEINEMANN'S tes under simultaneous shear and compression are interpreted in the light of the general theor developed. The implications of the theory concerning the behavior of a ball inserted int the ice, and the flow of the upper layers of a glacier in compressing or extending flow, are co sidered. The theory allows certain predictions to be made about the effects of complicate stressing systems, and explains qualitatively the anomalous behavior of glaciers in area where large stresses are acting in the ice because of its flow. *Subject Heading:* **1. Glacia velocities.**—*SIPRE abstract.*

11.6–210 551.324.51(584.8

Avsiuk, G A, **Certains renseignements sur le mouvement de la glace dans les glacier du Thian-Chian.** [Some data on ice movement in the Tien Shan Mountain glaciers] (I I.U.G.G. Association of Scientific Hydrology, **Symposium de Chamonix, Sept. 1958,** pub Gentbrugge, **1958.** p. 72–104. 12 figs., 14 refs. in Russian.) **DWB** (551.311 I611 sy)—Th characteristics of Inylchek, Petrov, Grigor'ev, and Karabatkak Glaciers, each belonging to different type of mountain glacier, are described, and their movement is discussed in detai Inylchek Glacier belongs to the longitudinal valley type and is the largest in the region, wit a length of about 60 km; Petrov Glacier is of a type characterized by a short tongue (21. sq km) and a large, relatively flat accumulation basin (52.7 sq km); Grigor'ev Glacier is a fla summit glacier, which flows from the center to the periphery; and Karabatkak Glacier is c the smaller valley type, having a length of 3.5 km and a mean width of 750 m. The commo characteristics of all these glaciers include: visco-plastic flow in the active portions, and th absence of local currents in the stagnant portions, except for local dislocation movement taking place in isolated ice blocks. The tongues of large valley glaciers consists of a serie of individual streams; the tongues of smaller glaciers form a unitary ice mass. Dead ic occupies great areas in large glaciers, occurs in small confined patches in smaller glaciers and is absent in glaciers of the flat summit type. *Subject Headings:* **1. Glacier velocitie 2. Tien Shan Mt., U.S.S.R.**—*SIPRE abstract.*

11.6–211 551.324.51/54(449.94

Lliboutry, L, **La dynamique de la Mer de Glace et la vague de 1891–95 d'après les mesure de Joseph Vallot.** [Dynamics of the Mer de Glace and the wave of 1891–95 according t the measurements of Joseph Vallot.] (In: I.U.G.G. Association of Scientific Hydrology **Symposium de Chamonix, Sept. 1958,** pub. Gentbrugge, **1958.** p. 125–138. 5 figs., 4 tables 17 refs., eqs.) **DWB** (551.311 I611sy)—The causes for the ice wave, which appeared to mov downglacier at a rate of 800 m/yr (6 times faster than the surrounding ice), are examine theoretically. The portion of the glacier immediately below the bend is found to have sli over its bed, while the lower portion did not slide even though it was at the limit of gliding, th speed of deformation in the second portion governing the speed of flow in the first. Bedroc friction, calculated by an improved formula, was 1.8 bars for the 2d portion (static friction and 1.0 bar for the 1st (dynamic friction). This difference in friction may explain the sporadi movement of glaciers. The glacier wave of 1891–95 is attributable to the decrease in dynami friction by 1 or 2% and a simultaneous increase in sliding speed by 28%. At the same tim longitudinal pressure increased as a result of deformations in the glacier, especially at the ben

above the 1st portion, equilibrating the surcharge of ice. The results are contrary to Weertman's theory of bedrock friction and agree with that of the author. *Subject Headings:* **1. Glacier velocities 2. Mer de Glace, France.**—*SIPRE abstract.*

11.6–212 546.212:548.5

Rigsby, G. P., **Effect of hydrostatic pressure on velocity of shear deformation of single crystals of ice.** *U. S. Snow Ice and Permafrost Research Establishment, Research Report* 32, May **1957.** 7 p. 10 figs. (incl. photos), table, 2 refs. **DWB**—Apparatus was built for deforming ice crystals under hydrostatic pressures up to 350 atmospheres. Single crystals were placed in the mounts in such a way that the deformation occurred by gliding on the basal glide plane. It was found that the shear strain rate increased as the pressure was increased at constant temperature, but that the rate is practically independent of hydrostatic pressure when the difference between the ice temperature and the melting point is kept constant. *Subject Headings:* **1. Ice viscosity 2. Ice crystals.**—*SIPRE abstract.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Watson-Watt and radar development,** 11.6–8; **IGY Antarctic program** (Barnier), 11.6–18; **Gibraltar met. station** (Hurst), 11.6 36; **Radio satellite tracking** (Harris et al.), 11.6–151; **Current and tidal measurement techniques** (Timonov, Soskin), 11.6–183; **Precip. measurement techniques** (Roll), 11.6 234; **Heating degree—day temp. determination** (Thomas), 11.6–296; **Radiosonde altitude determination** (Gilbert et al.), 11.6–303; **Wind speed determination** (Brogmus), 11.6 307; **Rainfall frequency distribution analysis** (Huff, Neill), 11.6–334; **Climatic diagrams** (Lieth), 11.6–358.

11.6–213 551.501.721:551.510:551.521.32

Kaplan, Lewis D. (*M.I.T., Cambridge*), **Inference of atmospheric structure from remote radiation measurements.** *Optical Society of America, Journal,* 49(10):1004–1007, Oct. **1959.** 3 figs., 6 refs. **DWB**—A detailed analysis of the structure of the atmosphere, including the three-dimensional distribution of temperature and water vapor, can be obtained from the spectral variation of its thermal radiation as viewed from a reconnaissance aircraft or earth satellite. In order that the measurements be capable of unambiguous interpretation, however, it is essential that the selection of spectral intervals to be used are based on a carefully planned interpretation scheme. A possible program is outlined, in which the temperature distribution is obtained by measurements in the 15μ CO_2 band and the water vapor distribution obtained by simultaneous measurements in the rotational band. The temperature-and-pressure dependence of the absorption coefficients must be taken into account. The instrument should be a multiple-slit or multiple-detector grating spectrometer, capable of resolving 10 cm^{-1} at 15μ. Spectral models and methods of analysis of the spectra are discussed briefly. *Subject Headings:* **1. Atmospheric structure 2. Spectral measurement of atmospheric structure.**—*Author's abstract.* Ⓢ

11.6–214 551.501.71:551.510.3:681.143

Miller, Paul H. (*Atmospheric Studies Branch, Instrument Operations Div. Test Dept.*), **Slide rule for computing the density of atmospheric air at ground level.** *U. S. Naval Ordnance Test Station, NOTS TP* 2185; *NAVORD Report* 6465, Feb. 18, **1959.** 6 p. fig. **DWB**—A slide-rule calculator for determining the density of atmospheric air at ground level in slugs per cubic foot is described. Densities are determined as functions of pressure (in millibars), temperature (in degrees Fahrenheit) and relative humidity (expressed as a percent and with respect to water), and are accurate to the nearest 10^{-5} slugs/foot^3. *Subject Headings:* **1. Air density computation 2. Slide rules.**—*Author's abstract.*

11.6–215 551.501.75:551.508.56

Hansen, Frank V. and Taft, Paul H. (*both, White Sands Missile Range*), **Plotting systems for the evaluation of double-theodolite balloon-measured winds.** *American Meteorological*

Society, Bulletin, 40(5):221–224, May **1959.** 4 figs., 4 refs. **DWB, DLC**—The inaccuraci inherent in single theodolite wind observation methods necessitate the use of double theodoli systems to determine winds used for missile launchings. Two approaches leading to the d velopment of double-theodolite plotting boards are presented as a solution for rapidly evalua ing double theodolite balloon measured winds. The accuracy of wind data derived from use the boards is compared to computed values. *Subject Heading:* **1. Double theodolite sounding** —*Authors' abstract.*

11.6–216 551.501.75:551.507.321.4:551.554(5

Tateno, Japan. Aerological Observatory, **On the winds in the lower atmosphere.** *Journal*, 6(3):119–130, Jan. **1959.** 8 figs., 2 tables, 5 refs. In Japanese; English summa p. 119. **DWB, DLC**—Since September 1958, observations of the lower atmosphere by a ca tive balloon have been made at Tokai near the coast of the Pacific Ocean, about 110 km to t northeast from Tokyo. Temperature, wind direction and velocity are being observed 3 tim a day (06h, 12h, and 15h L.M.T.) as high as 600 m or more, if possible. In this paper the fo lowing data are presented and discussed: 1) wind roses at various heights for every mont 2) distribution of the mean velocity of the wind with height for prevailing NE and N wind distribution of mean velocity of the winds from the sea and from inland. From these figure the existence of a maximum wind velocity layer near the ground was recognized, and the might be some effect of local circulation of land and sea breeze on the distribution of wind velo ity with height; 3) an isopleth of wind velocity from 3 hourly observations; 4) the variation wind direction with height. It is found that the frequency of veering is minimum at the heig of 250 m in the early morning; 5) a relation between the wind velocity in the maximum wi velocity layer near the ground and its height variation. It is found that the larger the wi velocity in the layer, the greater its height; 6) there might be no distinct relation between t wind velocity in the maximum wind velocity layer and height of minimum layer. *Subje Headings:* **1. Low level wind measurement techniques 2. Wind variation with height Captive balloon data 4. Tokai, Japan.**—*Author's abstract.*

11.6–217 551.501.777:551.578.4:551.508.7

Krasovskiĭ, A. A., **K voprosu ob uchete zimnikh osadkov.** [The question of computi winter precipitation.] *Meteorologiia i Gidrologiia*, Leningrad, No. 1:60–61, Jan. **1959.** tabl 5 refs. **DWB, DLC**—In an earlier study V. N. Razumikhin (*Meteorologiia i Gidrologii* No. 1:46, Jan. **1957**) pointed out that calculations of the amount of water in the snow cov at the start of spring thaw by means of snow surveys and rain gage observations at the Ersho weather station for the period 1951–1955 gave very similar results except for the winter of 195 1953. He attributed this agreement to the frequently occurring snowstorms, which blow sno into the rain gages and compensate for the snow blown out. This indicates that althoug precipitation does not fall from clouds the snow entering the rain gage during a ground snow storm is measured as cloud precipitation. Hence it is impossible to measure precipitatio falling into a rain gage from ground snowstorms and not from clouds. However, if the tot evaporation from the snow cover for the entire winter is computed and the total is added t the mean water content of the snow obtained from snow survey it is found that the rain gag measurements are 25% short. *Subject Headings:* **1. Snowfall measurement techniques 2 Rain gage errors.**—*I.L.D.*

11.6–218 551.501.9 551.582.2(99)(699.77

Aubert, Michel, **L'établissement de la Nouvelle-Amsterdam.** [Establishment of Ne Amsterdam.] *France. Ministère de la France d'Outre-Mer, Terres Australes et Antarctique Françaises*, Paris, No. 6:5–20, Jan. March **1959.** 7 figs., chart, 3 tables.—Concise study of Ne Amsterdam Island, 30°S 77°E with a short survey of climate, geology, flora and conditions o living in this most northern country of the French Southern Territories. Description of dwell ings, electric works, radio station, meteorological station and its equipment. Climatologica means of temperature, precipitation, evaporation, sunshine, surface wind and upper wind ar given in tables. *Subject Headings:* **1. Meteorological stations 2. Climate of New Amsterda Island 3. New Amsterdam Island.**—*A.V.*

11.6–219 551.501.9:551.586:581.5(675)

Dupriez, G., **Le réseau d'écoclimatologie de l'INEAC.** [The ecoclimatological network of the INEAC.] *Institut National pour l'Etude Agronomique du Congo Belge, Brussels, Bulletin d'Information*, 8(5):283–301, Oct. **1959.** 8 figs., 3 charts, table. **DWB**—The ecoclimatological network of the INEAC in Belgian Congo and Ruanda-Urundi now has about 60 stations distributed in the principal natural regions. Author describes the site of the stations. Sites have been standardized for the different regions of Belgian Congo. Description of the equipment of the network and classification of the stations are given. The organization of observations and centralization of results are commented on. The coordination of the climatological investigations in Belgian Congo and Ruanda-Urundi, as also the constant collaboration between the Meteorological Service and the Climatological Department of the INEAC are put into evidence. Charts represent the distribution of the ecoclimatological stations, the location of the stations measuring evapotranspiration and of those measuring solar radiation. A table indicates the geographical co-ordinates of the various stations and the date of their starting into service. *Subject Headings:* **1. Ecoclimatological networks 2. Belgian Congo.**—*H.V.*

11.6–220 551.501.1:551.515.3

Rossmann, Fritz O. (*White Sands Missile Range, New Mexico*), **On waterspouts: how to observe and photograph them.** *Marine Observer*, London, 29(183):28–30, Jan. **1959.** fig., ref. **DWB, DLC**—The origin of tornadoes and waterspouts, their shapes and movements and the attendant weather situations are discussed. *Subject Heading:* **1. Waterspout observation techniques.**—*N.N.*

OBSERVATIONAL DATA

See also: **IGY Antarctic program** (Barnier), 11.6–18; **IGY research,** 11.6–19; **IGY Antarctic met. program** (Wexler), 11.6–20; **IGY ionosphere program** (Helliwell), 11.6–21; **IGY hydromet. program,** 11.6–22; **IGY solar program** (Kopecky), 11.6–84; **Auroral data** (Vegard et al.), 11.6–122; **Seismic data,** 11.6–165; **IGY oceanog. program** (Gougenheim), 11.6–174; **Water resources data,** 11.6–191; **April weather U.S.** (Andrews), 11.6–243; **Synoptic conditions for frost** (Vollprecht), 11.6–298.

11.6–221 551.506.1:551.577(492)

*Netherlands. Meteorologisch Instituut, **Regenwaarnemingen,** [Precipitation observations, 1954 and 1958, pub. **1959.**] Its *No.* 117, entirely tables. One volume per year. Price: 10.00. **DLC, DWB**—Since 1932 the records of daily precipitation at the 300 stations recording precipitation in the Netherlands have been published separately from the "yearbook" wherein the totals for each month are published. The present series is compiled by machine tabulation and photo reproduction. The monthly tables of this publication contain the daily amounts of precipitation together with the amounts per decade and per month, at all stations of the Royal Netherlands Meteorological Institute, where in 1958 measurements were made regularly. The total yearly amounts are given in separate tables. A chart shows the distribution of the stations over the country which is subdivided into 12 natural regions and a table gives a list. *Subject Headings:* **1. Observational data 2. Precipitation data 3. Annual precipitation bulletins 4. Netherlands.**—*A.V.*

11.6–222 551.506.1:551.582.2(493)

*Sneyers, R., **Le temps en 1958.** [The weather in 1958.] *Belgium. Institut Royal Météorologique, Publications, Ser. B*, No. 26, **1959.** 48 p. 15 figs., tables. **DLC**—Description of the weather in Belgium during the year 1958. The author examines successively the evolution of the principal climatological factors during 1958 and makes comparisons with their normal values. The annual course of atmospheric pressure, wind regime, sunshine duration, cloudiness, temperature and air humidity at Uccle are studied and presented on graphs. The departures of extreme mean temperatures from the normal value are presented on charts for the different regions of Belgium and for the different seasons and the vegetation period. Rainfall distribution is given in % of the normal value for the different regions of the country and the different seasons. The second part gives a monthly weather summary with data of 5

Belgian climatological stations and the monthly regional averages of precipitation. The yea 1958 was characterized by frequent insolation deficits, a cold spring, absence of severe cold and hot weather and by a persistent humidity excess during the second half of the year. *Sub ject Headings:* **1. Annual climatic data summaries 2. Uccle, Belgium.**—*A. V.*

11.6–223 551.506.1:551.582.2(492

Ten Kate, H., **De winter van 1958/59.** [The winter of 1958/59.] *Hemel en Dampkring* The Hague, 57(4):102, April **1959. DWB, DLC**—The winter of 1958/59 (Dec., Jan., Feb.) taken as a whole, was normal in the Netherlands; only the precipitation shows an excess an only Feb.—dry and foggy—was remarkable. At De Bilt, the mean temperature was 2.4° (normal: 2.2°C). The lowest temperature, −14.3°C was observed at Spijk on Jan. 16 an the highest temperature, 18.9°C at Maastricht on Feb. 28. Sunshine duration varied strongl from place to place: South Limburg had 203 h sunshine and Eelde only 146 h. Also precipita tion varied strongly from NW, 217 mm, to SE, 154 mm, whereas the normal amount for bot regions is 160 mm. *Subject Headings:* **1. Climatic data 2. Netherlands.**—*A. V.*

11.6–224 551.506.8:551.586:581.14(43

†Band, Günter, **Phänologische Daten als Ausdruck klimatischer Wirkungen.** [Phenol logical data as an indication of climatic effects.] *Germany. Deutsche Demokratische Republik Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 7(47), **1959.** 24 p. 16 figs 28 refs. German summary p. 23. **DWB, DLC**—This study of relationships between tempera ture, precipitation and isolation vs. blossoming of snow drops and crop yields includes severa maps featuring the situation in Germany for the period 1936–1944. By and large it is demon strated that although there is a general relationship, a specific and numerical representativ relationship is very problematic. The biological process is not dependent on climate. *Subje Headings:* **1. Phenological data. 2. Climatic effects on plant life 3. Germany.**—*W. N.*

11.6–225 551.506.8:551.524.36:581.14(71

*Boughner, C. C. and Kendall, G. R., **Growing degree-days in Canada.** *Canada. Meteorological Branch, CIR*-3203, *TEC*-303, May 25, **1959.** 21 p. 10 figs., 2 tables, 6 refs., eq **DWB**—The amount of growth in many plants is roughly proportional to the accumulated exces of the daily mean temperature above a threshold value of 42°F. Listings of accumulated de gree-day totals above 42°F are given for 1957 and 1958 for 146 Canadian stations along wit charts showing the areal distribution of this parameter for Canada. Since growing degree-da computations have not been made for an extended period of time in Canada, it is not possib to derive long-term averages or normals from actual monthly values. A method for calculatin normal values for a representative group of stations which makes use of the average monthl temperature data for these stations is outlined. Listings of calculated normal monthly an annual growing degree-day values are given for 80 stations. Charts are also given showin the average dates of beginning and ending of the vegetative season based on mean temperature above 42°F. *Subject Headings:* **1. Degree-day growing data 2. Degree-day calculatio 3. Canada.**—*Author's abstract.*

11.6–226 551.506.8(49

*Lardinois, Emile, **Observations phénologiques à Uccle au cours de l'année 1958.** [Phenol logical observations at Uccle during 1958.] *Ciel et Terre*, Brussels, 75(5/6):220–224, May June **1959.** 5 tables. **DLC**—Report of the phenological observations made at Uccle (Belgium and at certain stations located in central, eastern and southeastern Belgium during 195 The author gives a short summary of the weather at Uccle during the first three seasons of th year. He indicates the dates of the start of blossoming for about fifty plants and also th divergence with regard to the normal date of flowering (period 1896–1958). *Subject Heading* **1. Phenological observations 2. Uccle, Belgium.**—*A. V.*

11.6–227 551.506.8(49

*Woudenberg, J. P. M. et al., **Het fenologisch onderzoek in 1958.** [Phenological investig tions in 1958.] *Landbouwkundig Tijdschrift*, Wageningen, 71(18):569–577, Oct. **1959,** an 71(19):654–659, Nov. **1959.** 6 figs., 10 tables. **DA**—A survey is given of the weather in th

Netherlands in 1958 with diagrams for precipitation, temperature and sunshine duration. Phenological observations all over the Netherlands are gathered. The phenology is treated of wild plants in the first five months of 1957 and 1958 with tables giving the mean flowering-times for 21 plants. A review is given of the flowering-times of herbaceous plants in the summers from 1940 till 1957 with data presented in graphical and tabular form for 12 plants. The behavior of migrating butterflies and birds in the Netherlands is discussed for 1958. Mean data are given of some phenological stadiums from 1933 to 1946 for winter- and summer-wheat, winter rye, summer barley, oats and peas. Isotherm charts show the temperature course in various fruit-growing regions and tables give a survey of the development of several fruit varieties in some important fruit centers in 1958. *Subject Headings:* **1. Phenological observations 2. Netherlands.**—*A. V.*

INSTRUMENT CARRIERS

See also: **Weather ships** (Floherty), 11.6–12; **Portable fire weather station,** 11.6–62; **Sec. D7,** p. 860; **Captive balloon data,** 11.6–216; **Ship-borne rain gages** (Roll), 11.6–234.

11.6–228 551.507.3:551.557

*Mantis, Homer T. (*Dept of Mechanical Engineering*), **Winds and wind structure at 100,000 feet from constant altitude balloon trajectories.** Minnesota. Univ. School of Physics, Contract AF 19(604)-2207, Final Scientific Report (Technical Report), April **1959.** 84 p. figs., 3 tables, 4 refs., mostly graphs (folded). **DWB**—Balloon flights from May 23, 1957 to Dec. 18, 1958, to monitor cosmic rays at 100,000 ft were conducted by the School of Physics of the Univ. of Minnesota. Trajectories were calculated by cameras and by AN-GMD-1 radar using Signal Corps radiosonde transmitters for telemetering information. All available data for IGY flights are tabulated and detailed trajectories presented. Three-hour average winds are computed for the 58 IGY flights and for all other flights over Minnesota since 1952. Small scale motions are also analyzed from direct tracings. Means and variance of 3-hour average winds are given for 40°–48° lat. range by month and in 2 altitude ranges (from 75,000–95,000 ft and >95,000 ft), and for each season for 15°–25°, 30°–35°, 40°–48° and 50°–55°N. The strongest east winds are in winter and strongest west winds in spring and are predominently zonal. The variance of the zonal component is an order of magnitude greater than that of the meridional component. Spectral analysis of frequencies of small scale fluctuations shows at least half of the variance in summer is accounted for by frequencies >1/360 cycles/min, small residual variances show an almost total absence of travelling cyclones and anticyclones similar to those in troposphere. Summer winds are basically easterly at 22 knots. In the transition season winds are weak and erratic. In winter west winds up to 100 km prevail. *Subject Headings:* **1. High level winds 2. Constant level balloon data 3. Minnesota M. Middle West, U. S.**—*M. R.*

11.6–229 551.507.32:551.508.765:551.578.11:551.576

Simidchiev, D., **Edin opit za izmervane visochinata i debelinata na vodni oblatsi.** [An attempt at measuring the height and thickness of water clouds.] *Khidrologiia i Meteorologiia,* Sofia, No. 3:84–85, **1959.** 3 figs. **DLC**—A balloon-borne instrument with a hot wire sensing element for measuring water content of clouds is described. The proposed instrument is under laboratory investigation. *Subject Headings:* **1. Cloud water content meters 2. Balloon-borne cloud meters.**—*G. T.*

11.6–230 551.507.32:551.510.53:551.521:551.571.7

Dollfus, Audouin, **Quelques observations géophysiques et astronomiques effectuées en ballon dans la stratosphère.** [Some geophysical and astronomical observations by balloon in the stratosphere.] *Académie des Sciences, Paris, Comptes Rendus,* 249(23):2602–2604, Dec. 9, **1959.** 3 refs. **DWB, DLC**—Account of two balloon ascents in the stratosphere. The former aerostatical device, a group of 30 sounding balloons chained up to a nylon rope 50 m long, carried into the stratosphere a gondola containing 140 kg automatic observation instruments. The second experiment involved 100 balloons along a 450 m cable making it

possible to send up a load of 450 kg. The author mentions the instruments carried aloft an describes the observations made during these 2 ascents. The observations enabled to inves gate the atmospheric diffusion at tropopause level and to take a measurement of the wat vapor content of the stratosphere. Diffusing sheets extending like perfectly stratified layer often only some tens of meters thick, were observed at tropopause level. The measuremen of water vapor content proved the little known fact that the atmosphere is saturated wi water vapor through a great part of its depth. These results find application in certain astr nomical observations. *Subject Headings:* **1. Balloon clusters 2. Stratosphere balloon ascen 3. Stratospheric radiation 4. Stratospheric humidity.**—*A. V.* Ⓢ

INSTRUMENTS

See also: **Portable fire weather station,** 11.6–62; **Radiometers** (Aleksandrov), 11.6–76; **Radar echoes from auroras** (Umvin), 11.6–121; **Oceanog. instruments** (Gougenheim), 11.6–174; **Oceanog. instruments** (Wolff), 11.6–175; **Lysimeter data** (Lawes), 11.6–202; **Double theodolite sounding** (Hansen, Taft), 11.6–215; **Rain gage errors** (Krasovskiĭ), 11.6–217; **Cloud water content meters** (Simidchiev), 11.6–229; **Photoelec. spectrometers** (Lenoble), 11.6–289; **Radiosonde ascents** (Kuhn et al.), 11.6–291; **Radiosonde altitude determination** (Gilbert et al.), 11.6–303.

11.6–231 551.508.

Monteith, J. L. and Szeicz, G. (*both, Rothamsted Exp. Station, Harpenden, Herts.*), **TI performance of a Gunn-Bellani radiation integrator.** *Royal Meteorological Society, Quarter Journal,* 86(367):91–94, Jan. **1960.** 3 figs., 4 refs., 2 eqs. **DWB, DLC**—An alcohol-fill Gunn-Bellani radiation integrator, exposed at Rothamsted from June to Dec. 1958, ga weekly distillation totals that were a linear function of short-wave radiation on a horizont surface above a limit of 500 cal $cm^{-2}week^{-1}$. Laboratory experiments with both alcohol- a water-filled models reveal a threshold radiation intensity which can be estimated from t properties of the distilling fluid and the partial pressure of air within the instruments. D tillation is negligible below the threshold, but above it is proportional to the excess radiatio Because the relation between absorbed heat and radiation incident on the horizontal surfa depends on solar altitude and on the proportions of direct and diffuse radiation, it is diffc to predict field response from laboratory data. *Subject Headings:* **1. Radiation balan meters 2. Gunn-Bellani radiation integrator 3. Rothamsted, Eng.**—*Authors' summary.*

11.6–232 551.508.71 551.571:611.7

Pápai, László, **Normal hajszálak mikroszkopikus vizsgalata.** [Microscopic examinati of normal hair.] *Időjárás,* Budapest, 63(1):38–46, Jan./Feb. **1959.** 6 figs. (incl. photo table, 10 refs. German summary p. 38. **DLC**—Structural properties of hair are describe It is shown by means of photographs that most of the water absorbed by hair stays in t passages between cells. A significant part of the changes in hair volume is caused by the e pansive action of water in the passages. Eventually water also penetrates the cells of the ha resulting in a second change of volume. After drying some water is left in the hair whi causes considerable hysteresis. The extent of hysteresis can be reduced by regeneratic Data on changes in the volume of hair are included in the paper. It is found that only 8 of the absorbed water is responsible for changes in length, the rest is used for lateral increase volume *Subject Headings:* **1. Hair hygrometers 2. Water absorption by hair.**—*Tran of author's abstract.*

11.6–233 551.508.765 551.578.

Mészáros, Ernő, **Az esőcsepp-spektrum mérésének módszerei.** [Methods of measuri raindrop spectra.] *Időjárás,* Budapest, 63(1):51–52, Jan./Feb. **1959.** 11 refs. **DLC** The various direct methods developed for recording raindrop spectra, such as the filter pap flour pellet, oil, hydrophotographic and electrical methods are reviewed. The methods bas on photoelectric principles are believed to be the most effective at present. An instrume based on such principles is in use in the Soviet Union; its brief description is given (based Krasnogorskaia, 1955). No satisfactory method exists for continuous recording of raindr

ectra. *Subject Headings:* **1. Raindrop size distribution measurement 2. Raindrop size stribution meters.**—*G.T.*

11.6–234 551.508.77:551.501.777:551.507.2

Roll, H. U., **Zur Niederschlagsmessung auf See: Ergebnisse von Vergleichsmessungen f Feuerschiffen und benachbarten Inseln.** [Precipitation measurements at sea: results comparative measurements from light ships and neighboring islands.] *Hamburg. Seetteramt, Einzelveröffentlichungen*, No. 16, **1958.** 14 p. 3 figs., 3 tables, 8 refs. **DWB**—ip-borne rain gages currently employed in over-sea precipitation measurements are discussed. eir efficiency as dependent on elevation of placement aboard is related to wind exposure, ovement of the ship, *per se*, and its speed relative to the characteristics of the precipitation; pects which are considered here. The idealized rain gage would be one that could be placed ght on the sea surface and protected from sea splash and movements. Comparative results tween 5 ship-borne and some stationary gages located at several locations of the Helgoland d the Neuwerk icelands in the northern German archipelago are given in monthly means d percent for the period 1949–1956. Some 100 monthly sums of precipitation show a mean ecipitation difference of −8.1% and a mean departure of 31.4% between the ship and the ation recordings. *Subject Headings:* **1. Rain gages 2. Precipitation data 3. Helgoland, ermany 4. Neuwerk, Germany.**—*W.N.*

11.6–235 551.508.822:551.510.52

Miller, Paul H., **Modified radiosonde for obtaining lower-level atmospheric data.** *U. S. aval Ordnance Test Station, China Lake, California, NAVORD Report* 6600: *NOTS TP* 2334, t. **1959.** 16 p. 5 figs. **DWB**—A standard AMT-4 radiosonde modulator has been modi-d at the Naval Ordnance Test Station for use in obtaining micrometeorological temperature ta in the lower levels of the atmosphere. The modification consists of rewiring the basic rcuit to eliminate the taking of relative humidity data and increase the number of high refer-ces made. The sequence of transmitted data consists of alternating low references and mperature data throughout a range of four contacts followed by a high reference. This quence is repeated until the 105th contact is reached, a point well above the upper limit of e range of interest in a low-level sounding. The modified radiosonde may be used as either captive instrument or attached to a slow-rising balloon. *Subject Headings:* **1. Radiosondes Tropospheric temperature measurement.**—*Author's abstract.*

11.6–236 551.508.822:551.506.22:551.510.53

U. S. Weather Bureau, **United States radiosonde compatibility corrections for application very high levels and instrument schedule by stations during the IGY.** Wash., D. C., Strato-heric Analysis Project, Office of Meteorological Research, July **1959.** Each section repaged. s., tables, 4 refs. **DWB** (M08.822 U587un)—Brief description of an outrigger radiosonde N/AMT type), originally developed by the U. S. Army Signal Corps and capable of reflecting out 94% of incident solar radiation. Improvements have been made on this instrument to duce the incompatibility of stratospheric temperatures and heights. Details are reported and tabulated. *Subject Heading:* **1. Radiosondes.**—*N.N.*

11.6–237 551.508.822

Usol'tsev, V. A. and Manuĭlov, K. N., **Osnovnye osobennosti radiozonda A-22-III.** Basic characteristics of the A-22-III radiosonde.] *Leningrad. Nauchno-Issledovatel'skiĭ stitut Gidrometeorologicheskogo Priborostroeniia, Trudy*, No. 5:3–16, **1957.** 8 figs., ref. **LC, DWB**—The various defects of the comb radiosonde P3-049 and the requirements of an proved radiosonde are listed; e.g., the meteorological receiver must develop considerable rce in order to overcome the force of friction arising during the displacement of the ends of e pens upon the combs; the teeth of the combs are too wide, etc. On the basis of available de radiosondes, the properties of a suitable radiosonde are best satisfied by a rotating code ctor. In a cheap network radiosonde pressure is measured most accurately by a membrane eroid made of a special alloy (elinvar) having a low heat coefficient and a high elasticity odule, a small elasticity hysteresis and a temporary residual deformation; in case the mem-ane is made of top phosphorous bronze, a power thermal compensator is used; and transmission

is improved by eliminating external friction. The temperature element is made of a ther bimetallic spiral, freed from the function of moving a pointer along the contact surface of comb radiosonde; the two ends of the spiral having opposite direction of winding are faste to the framework. The construction of the power thermal compensator, of the moist sensing element, the transmission mechanism, and the code plate are described with the of photographs. The operation and efficiency of the radiosonde are discussed. *Sub Heading:* **1. Radiosondes.**—*I.L.D.*

11.6–238 557.508.91:551.51C

American Society of Mechanical Engineers. Committee on Air Pollution Contr **Instruments for the study of atmospheric pollution.** 3rd ed. New York. n.d. 23 almost entirely lists. **DWB** (M10.42 A512i)—An outline list of instruments which could used for study of smoke density, particulate matter (sampling, measurement, counting, distribution and analysis) and meteorological equipment for use in air pollution control research. *Subject Headings:* **1. Atmospheric pollution instruments. I. Schwartz, Cecil H** *M.R.*

11.6–239 551.508.91:551.51C

Rykhter, E. V. and Shlygina, N. V., **Opredelenie zapylennosti atmosfernogo vozdukha elektrofotokolorimetre.** [Determination of dust in the atmosphere with an electroph colorimeter.] *Gigiena i Sanitariia*, Moscow, No. 9:18–22, Sept. **1958.** 4 figs., 3 tables, 4 r English summary p. 22. **DLC**—The author describes the photonephelometric method determining the quantity of dust in the atmosphere. Air samples are absorbed at a rat 120 liters per min into an alcohol-glycerine mixture and samples of absorbed dust are exami by means of a photoelectric colorimeter. Calibration curves, different for each kind of d must be constructed. Calibration curves showing the relationship of atmospheric carbon cement dust concentration to photoelectric current are presented. The results of an exp ment to determine the effect of atmospheric dust upon photoelectric colorimeter readings the efficiency of absorption of atmospheric dust by the liquid mixture are presented. Th indicate that the absorption of small size dispersions of carbon dust was 90–96% and the sorption from the smoke of boilers amounted to 90–100%. An experiment for determin the atmospheric content of cement dust is described and data show that amounts of 0.4–6 mg/m^3 could be determined. The advantages of the electrophotocolorimetric method c the weight method are discussed. *Subject Headings:* **1. Dust content of air 2. Dust meters** *I.L.D.*

11.6–240 551.508.94:551.594.11 551.594

Maund, J. E. and Chalmers, J. Alan (*both, Physics Dep., Univ. of Durham*), **Point-charge currents from natural and artificial points.** *Royal Meteorological Society, Quart Journal*, 86(467):85–90, Jan. **1960.** table, 13 refs., eq. **DWB, DLC**—When point discha occurs at an earth-connected point, ions of one sign travel to earth through the point w ions of opposite sign travel away in the wind. This stream of ions reduces the potential dient at the ground to leeward of the point below that to windward. Theory shows that, u suitable conditions, this difference in potential gradient is close to that predicted for a lin charge, even though the line is spread into a cone by turbulent diffusion. Measureme with point discharge from a 34 m mast show good agreement with theory, and this make possible to use the difference of potential gradient to determine the point-discharge cur through a tree. When applied to a line of trees, seasonal differences are found sugges smaller currents from trees in leaf than from bare trees. Measurements with a 12 m sycan tree in full leaf show no point-discharge current even in potential gradients up to 7000 v *Subject Headings:* **1. Point discharges 2. Potential gradient.**—*Authors' summary.*

11.6–241 551.508.94:551.594.12:551.59

Smiddy, M. and Chalmers, J. Alan (*both, Physics Dep. Univ. of Durham*), **Measuremen space charge in the lower atmosphere using double field mills.** *Royal Meteorological Soc Quarterly Journal*, 86(367):79–84, Jan. **1960.** fig., 9 refs., eq. **DWB, DLC**—Two do field mills (Smiddy and Chalmers, 1958) have been used to study space charge in the lo

n of the atmosphere. Results in fair weather show small values, often negative, which can explained in terms of radio-activity of the ground. Comparison with results from filtration paratus suggests that the latter may be in error when small ions are present in large numbers. sults in light or moderate rain show small space charges, but in heavy rain, negative space rges of the order of $-1000\ \mu\mu cm^{-3}$ are found, probably formed by splashing. In snowfall, re are charges of both signs of about $\pm 500\ \mu\mu cm^{-3}$. *Subject Headings:* **1. Electrical charge r the ground 2. Double field mills 3. Atmospheric electricity measurement techniques.**—*thors' summary.*

11.6–242 551.508.91 551.508.95

Rogers, Lewis H. (*Air Poll. Foundation, Los Angeles, Calif.*), **Continuous instrumentation atmospheric analyses.** *Air Pollution Control Association, Proceedings*, Vol. 50, 1957. ued 1958? *Paper* No. 27 (6 p.) 8 figs., 16 refs. **DWB** (M10.42 A298ap)—The trend to re automatic instruments and those which yield more information is described. Brief criptions are given of: a new dual recording colorimeter for atmospheric oxidants which s 2 separate reagents on samples taken on an intermittent basis; a pressurized nondispersive ared analyzer which measures hydrocarbons in the range of 0.3 ppm; an infrared filter otometer which measures atmospheric hydrocarbons; an unsaturated hydrocarbon recorder ed on the reaction between unsaturated and heated mercuric oxide; a differential coulometric ne analyzer; a potentiometric recorder for H_2S and HCN; a right angle scattering photom- r for measuring and classifying particles in 10 size ranges from 0.3 to 1.5μ; and an automatic chromatograph. These various instruments are used as examples to illustrate the areas which recent successes have been achieved in this rapidly growing field. *Subject Heading:* **Atmospheric pollution instruments.**—*Author's summary.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Cloud physics**, 11.6–24; **Aviation forecasting studies** (Huntoon), 11.6–47; **Data processing systems** (White et al.), 11.6–49; **Airways forecasts** (Houy), 11.6–50; **Space research and forecasting** (Williams), 11.6–153; **Tide forecasting** (Sager), 11.6–189; **Water supply forecasting** (Frohnholzer), 11.6–194; **Barotropic vorticity** (Pichler), 11.6–264; **Northern Hemisphere circulation classification** (Kletter), 11.6–267; **Synoptic climat.** (Barry), 11.6–364; **Weather type frequencies** (Pédelaborde), 11.6–365.

11.6–243 551.509.3:551.506.1:551.582.2(73)

Andrews, James F., **The weather and circulation of April 1959, including the role played an index cycle.** *Monthly Weather Review*, Wash., D. C., 87(4):153–161, April **1959.** 11 ., table, 6 refs. **DWB, DLC**—April 1959 was characterized by a lack of severe local stormi- s throughout most of the U. S. A similar condition prevailed in April of 1958 (1), in sharp ntrast to the stormy April of 1957 (2) when a record number of tornadoes was observed. m the northern Rocky Mountain States southeastward to the Gulf States, temperatures eraged below the seasonal normals, while west of the Rockies and in the northeastern third the Nation the weather was generally mild. The long period of unusual warmth continued ng the California coast, with new April temperature records being established. Precipita- n continued deficient in the northern Great Plains and upper Mississippi Valley, with some as reporting the least amount of record for the period Jan. to April. Subnormal amounts precipitation also fell in parts of the Southwest, thus continuing the dryness of the winter son. Despite the fact that few monthly records were established during April, pronounced nges in weather and circulation did occur. These changes can be related to a strong index le. *Subject Headings:* **1. Synoptic studies 2. Circulation index cycles 3. United States.**—*thor's introduction.*

11.6–244 551.509.327:551.515.23

Kadowaki, S., **On the application of 500 mb height anomaly to typhoon movement.** *Sendai, pan. Central Meteorological Observatory, Journal of Meteorological Research of Tohoku strict*, Vol. 12, Memoir No. 2, March **1959.** 6 p. 12 figs., 3 tables, 10 refs. Reprint from

Tenki, 5(6):180–185. In Japanese. **DWB**—The application of 500 mb height anomaly t typhoon movement has been studied at the Sendai District Meteorological Observatory sinc May, 1957. The calculation method of Z' at Sendai, characteristics of Z', preparation ar usage of Z' and three actual case studies are described. The application of Z' and $\Delta Z'$ to th movement of typhoon shows satisfactory results. *Subject Headings:* **1. Typhoon movemer forecasting 2. Upper air pressure-typhoon movement relationships 3. Japan.**—*J.H.W.*

11.6–245 551.509.329:551.510.72

*†Bailey, R. E.; Cannon, W.; Cassano, A. J.; Polan, M. and Richter, A., **Fallout predicto** Ford Instrument Company, Long Island City, N. Y., Contract DA-36-039-SC-78185, Quarter Report, No. 2, Oct. 1-Dec. 31, 1958, issued Jan. 15, **1959.** 75 p. 15 figs., 49 refs., 35 eq Also: **No. 3,** Jan. 1–March 31, **1959.** 112 p. 23 figs., tables, 33 refs., eqs. **DWB** (M(05 F711fa)—First report presents a functional flow chart that includes input parameters, th calculation of particle settling rates, the interpolation of winds in time and space, the calculatic of horizontal displacements taking topography and rainout into account, the accumulatic of final data, and a data output. Purpose of the second study was to establish the design bas for a fallout predictor improved to include such factors as discussed at the following meeting Boston, Jan. 7, Santa Monica, Jan. 14, and San Francisco, Jan. 15, New York, Jan. 28 and a Fort Monmouth, Feb. 25, 1959. The overall flow chart of the predictor is presented an discussed stepwise from input to output. The input data are: 1) bomb parameters; 2) a mospheric parameters as functions of height (temperature and pressure); 3) meteorologic data (observed and predicted wind and precipitation fields); 4) topographic characteristics the fallout area. *Subject Heading:* **1. Radioactive fallout probability forecasting. I. For Instrument Co., Long Island City II. Contract DA-36-039-SC-78185.**—*W.N.*

11.6–246 551.509.33:551.58

Grappe, R., **Contribution à l'étude de la prévision à moyenne et longue échéance.** [Co tribution to the study of medium and long range forecasts.] *France. Météorologie National Monographies*, No. 12, Feb. **1959.** 23 p. 16 figs., table, 2 refs. **DWB**—This monograp complements *Memorial* No. 38 of the French Meteorological Service. The possibility of su dividing the year into natural periods, functions of the evolution of the stable field, is invest gated. Author establishes, for the Paris region, a meteorological calendar subdividing th year into 22 large natural periods, replacing the division into 12 months; each period is su divided into sub-periods corresponding to the sequence of the frequent regimes and during whic a homogeneous current is observed over France. These sub-periods were found through grou ing the daily mean isallobaric charts of similar types for the larger area of Western Euro and the bordering ocean. This led to the recognition of 71 sub-periods for the year: the mean duration is between 4 and 5 days. Mean isallobaric charts were established for eve sub-period; they indicate the prevailing streams, and consequently the general aspect of weath for the region under consideration. Following the author's meaning, these isallobaric weath types charts reveal the large isallobaric movements which are the causes of changes in regim they represent the synoptic aspect of the larger atmospheric phenomena. *Subject Heading* **1. Medium and long range forecasts 2. Natural periods 3. Mean isallobaric charts 4. Pa region, France.**—*A.V.*

11.6–247 551.509.34:551.50

Vacheresse, Paul, **La prévision du temps à la portée de tous.** [Weather forecasts with the comprehension of everyone.] *Bulletin des Engrais*, Paris, No. 415:33–37, Feb. 19 4 figs., ref.—Short range weather forecast based on local observations. Recall of the princi of the pagoscope, indicator of hoar frost; comments relating to the pagoscopic graph a elaboration of a diagram on which temperatures are plotted in abscissa and the inversed hyg metric state in ordinate. This diagram shows 3 zones of frost probability (nothing to fe frost probable and frost certain). A second hygro-thermal diagram has been drawn in vi of precipitations forecast. Hygro-thermometric observations made at 7 a.m. are plott on the chart which includes 3 zones of precipitations probability (precipitations improbab uncertainty and precipitations). This method associated with general forecasts broadc

y the meteorological services may, in certain cases (stable atmospheric situation or same air ass), be useful for local short range forecasts. *Subject Headings:* **1. Objective frost forecasting Pagoscopic diagram 3. Hygro-thermal diagram.**—*A. V.*

11.6–248 551.509.6

†Vaillant, J., **L'aspect énergétique de la modification du temps dans le cadre de l'aménagement des territoires.** [The dynamic aspect of weather modification with reference to territorial development.] *La Technique de l'Eau*, Brussels, 13(150):21–27, June **1959**; 13(151):33–41, July **1959** and 13(152):31–43, Aug. **1959.** fig., 48 refs. **NN, ICJ**—Examination of new hydrological and agricultural prospects in arid or semi-arid countries. Review of the ideas formulated by H. Dessoliers at the beginning of this century as regards hydrogenesis. Survey of the experiments by H. Dessens and account of the planned experiments by means of solar-overheated areas. These areas may be of various types and in particular include an artificial heating with central area of heating by combustion. By means of these solar-overheated areas one expects to start the provoked convection at the time when natural convection is already important in the region, but before cumulonimbus have formed. Author examines the relationships between solar energy and weather. He explains briefly the possibilities of weather modification by using solar energy, and formulates remarks on the development of the arid or semi-arid regions. Pt. 2 concerns the study of local influences on weather—influence of topography, micro-relief, forests, towns, etc. Pt. 3 explains the general principle of an artificial solar-overheated area and includes the study of the various methods likely to be used for the purpose of modifying the weather. *Subject Headings:* **1. Artificial actions on weather 2. Solar-overheated areas.**—*A. V.*

11.6–249 551.509.617

Oddie, B. C. V., **First results of the Meteorological Office experiments on the artificial stimulation of rainfall.** *Meteorological Magazine*, London, 88(1043):129–135, May **1959.** figs., table, 5 refs. **DWB, DLC**—The results of 19 experiments on the artificial stimulation of rainfall are examined. They indicate rather strongly that a net decrease of rainfall has been produced, but it is argued that this result is too improbable on physical grounds to be accepted. It is inferred, however, that the standard rainmaking technique, when applied to frontal clouds in level country, is most unlikely to yield an appreciable increase—a conclusion which agrees with the findings of the U. S. Advisory Committee on Weather Control. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding experiments. 3. England.**—*Author's summary.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

DENSITY, COMPOSITION AND STRUCTURE OF THE ATMOSPHERE

See also: **Planetary atmospheres** (Urey), 11.6–93; **Atmos. structure** (Kaplan), 11.6–213; **Air density computation** (Miller), 11.6–214.

11.6–250 551.510.41:546.264:551.583.14

Les cycles de l'anhydride carbonique et les variations du climat. [Carbon dioxide cycles and climatic changes.] *La Nature*, Paris, No. 3295:483-484, Nov. **1959. DLC**—Study on the relationships between the various climates which prevailed over our planet and the probable fluctuations of the CO_2 content of the atmosphere. Account of the role played by the CO_2 molecules of the atmosphere in the absorption of certain infrared radiations, and reflections on the CO_2 exchanges between atmosphere and oceans. As a result of the "greenhouse effect" caused by the presence of CO_2, the atmosphere retains part of the solar heat, part of which should be function of the CO_2 quantity present in the atmosphere. After this hypothesis, the tropical periods were determined through enrichment in CO_2 and the glacial periods through impoverishment. Influence of volcanic activity, plant cover and human interference (coal and hydrocarbon consumption) on the atmospheric enrichment in CO_2 is examined. Author seems that a cyclic fluctuation is kept naturally and he gives a succinct description of it.

During the last 100 yrs, atmosphere underwent, with respect to the beginning of this perio a CO_2 increase of 13% which should square with an average theoretical rise in temperature about 0.55°C. Considering the increase in the use of combustibles it may be foreseen th in the year 2000 the CO_2 enrichment of the atmosphere shall cause an average rise in temper ture in the range of 2°C. *Subject Headings:* **1. Climatic trends 2. Carbon dioxide fluctu tions.**—*A. V.*

11.6–251 551.510.41:546.214:633.

Wanta, R. C. and Heggestad, Howard E. (*Ofs. Met. Res., U. S. W. B., Wash., D.* *U. S. D. A., Plant Industry Sta., Beltsville*), **Occurrence of high ozone concentrations in t air near Metropolitan Washington.** *Science*, Wash., D. C., 130(3367):103–104, July 10, 195 table, 10 refs. **DWB, DLC**—Relatively high concentration of surface ozone and the indicati that ozone is the inciting agent in fleck injury to tobacco were reported previously (1). Co siderable interest therefore attaches to weather parameters on the high ozone days which m throw light on the source and on the physiochemical processes affecting the ozone level. source in the direction of nearby Washington, D. C., and photochemical production of t oxidant are indicated. Days with appropriate wind direction but low peak ozone concentr tion are discussed in terms of coexisting weather parameters. The weather ensemble fou on high ozone days is considered in relation to instances of fleck injury for which peak ozo levels were not measured. *Subject Headings:* **1. Ozone concentration 2. Weather effects ozone amount 3. Tobacco cultivation 4. Washington, D. C.**—*Authors' abstract.*

ATMOSPHERIC POLLUTION

See also: **Atmos. pollution, Vienna** (Steinhauser et al.), 11.6–6; **Atmos. pollution conf.,** 11.6–26; **Radioactive waste disposal,** 11.6–75; **Measurement of radioactive impurities** (Aleksandrov), 11.6–76; **Atmos. pollution instruments,** 11.6–238; **Dust content of air** (Rykhter, Shlygina), 11.6–239; **Atmos. pollution control,** 11.6–285; **Smoke effects on nuclei formation** (Soulage), 11.6–321; **Carbon dioxide diffusion** (Báez, Fournier d'Albe), 11.6–367.

11.6–252 551.510.42:6

Manos, Nicholas E. and Fisher, Gail F. (*both, Air Pollution Medical Prog., Wash., D. C* **An index of air pollution and its relation to health.** *Air Pollution Control Association, Journ* 9(1):5–11, May **1959.** 4 figs., 2 tables, 5 refs. **DWB, DLC**—Urban centers in the U. S. c be ranked according to an index of air pollution based on general sources of air pollution, su as home heating, automobiles, and industry. This has been done in many different ways shifting the relative emphasis given to the various sources of air pollution. This index, in various forms, has been correlated with mortality for various causes using several age-sex-ra breakdowns. Indexes of socio-economic factors and other city characteristics are also tak into account. The objective is to determine which forms of the index correlated with m tality, being expected to yield useful background information on the geographic variati in mortality as related to air pollution sources and population characteristics. The findi to date indicate that 4 causes of death produce a large number of high positive correlati with the various indexes of air pollution, these being: 1) Malignant neoplasm of esophagus a stomach; 2) malignant neoplasm of the trachea, bronchus and lung; 3) arteriosclerotic he disease, including coronary disease; 4) chronic endocarditis not specific as rheumatic, and ot myocardial degeneration. *Subject Headings:* **1. Atmospheric pollution and health 2. M tality.**—*From authors' summary.*

11.6–253 551.510

Shaw, John H., **A determination of the abundance of nitrous oxide, carbon monoxide, a methane in ground level air at several locations near Columbus, Ohio.** Ohio State U Research Foundation, Contract AF 19(604)-2259, Scientific Report No. 1, June **1959.** 38 8 figs. (incl. photo), 2 tables, 16 refs. "This scientific report is based on a thesis submitted R. L. BOWMAN in partial fulfillment of the requirements for the Master of Science Degree.

udies of the infrared spectra of long path lengths of air (704 m) permitted determination the abundances of N_2O, CH_4 and CO in ground level air. The N_2O abundance was estimated 0.28±0.04 ppm with no seasonal variation detected. Air samples from greenhouses and rns showed an N_2O abundance of 0.33±0.04 ppm. The estimated abundances of CH_4 and O in ground level air were 2.4 ppm and 1.1 ppm, respectively. *Subject Headings:* **1. Air mpling and analysis 2. Atmospheric pollution data 3. Columbus, Ohio.**—*Author's abstract.*

UPPER ATMOSPHERE—IONOSPHERE

See also: **Upper atmos. bibliogs.** (Quiroz), 11.6–42; **Sec. D2**, p. 850; **Bibliog. on Ionosphere**, p. 928; **Stratospheric balloon ascents** (Dollfus), 11.6–230; **Tropospheric temp. measurement** (Miller), 11.6–235; **Radiosonde corrections for use at high levels**, 11.6–236; **Stratospheric winds** (Pogosian), 11.6–270; **Stratospheric temp.** (Zikeev), 11.6–297.

11.6–254 551.510.528:621.396

Hay, D. R. (*Univ. of Western Ontario, Canada*), **Apparent correlation between tropopause eight and long-distance transmission loss at 490 mc.** *Institute of Radio Engineers, N. Y., roceedings*, 47(6):1144–1145, June **1959.** 2 figs., 10 refs. **DWB**—An experimental UHF dio transmission path was established from Ottawa to Port Arthur, Ontario, during June 957. Continuous records were maintained for 7 days over this 640 mile path, using a 490 c/s signal, whose transmission loss was correlated with tropopause height above midpath Sault Ste. Marie) and height limit of polar or maritime air masses above midpath. A better orrelation was found between signal loss and tropopause height than might have been expected. igh tropopause corresponds to warm air and low tropopause to a cold air mass. The warm r in turn corresponds to unstable transmission and low loss, whereas the cold air to stable ransmission and high loss. *Subject Headings:* **1. UHF transmission-tropopause height relaonships 2. Tropopause effects on radio propagation.**—*M.R.*

11.6–255 551.510.528:551.551.5:551.557.5

†Miller, P. H. and Farnham, D. L., **Tropopauses and related atmospheric phenomena t the Naval Ordnance Test Station.** *U. S. Naval Ordnance Test Station, China Lake, Cali-rnia, NAVORD Report* 6533, NOTS TP 2226, Nov. **1959.** 152 p. 45 figs., 62 refs., eqs. **WB**—Tropopause data obtained and evaluated at the Naval Ordnance Test Station indicate very definite correlation between the major tropopauses and their leaves, and such phenomena s the jet stream, clear-air turbulence, mountain waves, and the formation of aircraft condensaon trails. A review of the literature on tropopauses and related phenomena is presented. *ubject Headings:* **1. Meteorology 2. Tropopause 3. Jet stream 4. Atmospheric turbulence . Clear air turbulence 6. Condensation trails 7. Mountain waves 8. Sierra wave.**—*uthors' abstract.*

11.6–256 551.510.53

Panofsky, Hans A. and Somervell, W. J., **The synoptic stratosphere.** *U. S. Navy Weather esearch Facility, Preliminary Research Report on Task 26* (High Tropospheric and Stratopheric Analysis and Forecasting), March **1959.** 54 p. figs., table, 9 refs. **DWB** (M10.53 5868sy)—The stratosphere, between the tropopause and about 100,000 ft., may be subivided into two layers; a lower layer which is characterized, except near the winter pole and n the tropics, by westerly winds which decrease in intensity upward, and an upper layer in hich the winds increase in intensity upward. The boundary between these two layers is, n the average, at about 50 mb in summer and 25 mb in winter. In the lower of these layers, ot only the mean speed but also the intensity of troughs and ridges decrease upward in inensity; these features are, in fact, somewhat feeble and smoothed replicas of the tropospheric ystems immediately below. A major exception exists around the pole where a cold cyclonic ortex is located which increases in intensity upward quite rapidly. The upper layer generally ontains systems which increase in strength as one moves upward and is more nearly indeendent of tropospheric configurations. Here, there exists a seasonal reversal of wind direction etween the tropics and the pole; westerlies in the winter and easterlies in the summer. Cor-

respondingly, there exists a large temperature variation at the poles, from about −75°C i winter to −35°C in summer. In general, the movements and development of stratospher systems are extremely slow; persistence is generally the best forecast technique. Howeve in northern latitudes in winter, relatively rapid and profound changes may occur betwee Dec. and the end of March. During this period, warming by as much as 50°C in a week ma be observed, occurring first at 10 mb and gradually spreading downward. Anticyclogenes at high levels accompanies the increase in temperature. This warming is rapid enough t deserve the term "explosive" warming, although, paradoxically, it is still sufficiently slow t permit persistence forecasts for 24 hours. The rate of warming is much greater than th cooling rate at the beginning of the winter season. *Subject Headings:* **1. Stratospheric structur 2. Synoptic upper air analysis.**—*Authors' abstract.*

11.6–257 551.510.534:551.508.82

Paetzold, Hans-Karl and Piscalar, F., **Vertikale Ozonverteilung und Synopsis.** [Vertic ozone distribution and synoptic meteorology.] *Germany. Deutscher Wetterdienst, Bericht* 7(51):101–104, **1959.** 5 figs., 14 refs. German summary p. 101. **DWB, DLC**—The ne measurements of the vertical distribution of ozone by optical radiosondes show a close relatio ship to other meteorological factors. Air masses of various origin can be identified more readil by optical radiosondes than by criteria applied heretofore. Ozone measurements indica vertical air movements which make the observations of ozones of vertical convergence an divergence possible. The observation of vertical ozone distribution in higher altitudes, an under any weather situation as well as in unpopulated regions became possible by developin optical radiosondes in the Institute of Weissenau. The vertical ozone distribution had bee measured at the Equator/Leopoldville 5°S/and at high latitudes/Skattora 70°N/directl the first time during the Geophysical Year. Five diagrams illustrate the ozone concentratio 1) at Leopoldville; 2) the Polar ozone distribution in pre-spring and 3) in summer; 4) th winter ozone distribution in Weissenau, Dec. 12, 1953; and 5) the "Equatorial and Pola ozone distribution in Weissenau in winter. Developing the above method may lead to observa tion of irregularities in the structure of the atmosphere which are significant for weath forecasting. *Subject Headings:* **1. Vertical ozone distribution measurement techniques Optical radiosondes.**—*O.T.*

11.6–258 535.34:551.510.534:546.211 551.521.3:551.5

Vigroux, E. (*Inst. d'Astrophysique*), **Emission continue de l'atmosphère terrestre à 9.** [Continuous emission of the terrestrial atmosphere at 9.6μ.] *Annales de Géophysique*, Pari 15(4):453–460, Oct./Dec. **1959.** 3 figs., 2 tables, 6 refs. **DLC**—Reports results obtained fro a large number of observations carried out at Arosa, Switzerland, at 1850 m altitude, in t region of the 9.6μ band of atmospheric ozone and the ϕ band of water vapor. The author giv a description of the installation which comprises a Perkin Elmer spectrometer of the 12 model, provided with a sodium chloride prism and a thermocouple. The emission spect of the terrestrial atmosphere show a continuous emission in the spectral region near 9.6 Ascribing this emission to water vapor permits computation of the absorption factor. Absor tion spectra in the ϕ band of H_2O are used to determine the water content, necessary for t computation. *Subject Headings:* **1. Emission spectra 2. Ozone spectra 3. Absorption water vapor 4. Arosa, Switzerland.**—*A.V. and author's abstract.* Ⓢ

RADIO METEOROLOGY

See also: **Tropopause effects on radio propagation** (Hay), 11.6–254.

11.6–259 551.510.62:551.5

Kazanskiĭ, K. V., **Zavisimost' pokazatelia prelomleniia vozdukha ot vlazhnosti.** [D pendence of the atmospheric refraction index on humidity.] *Akademiia Nauk SSSR, Izvesti Ser. Geofiz.*, No. 2:332–334, Feb. **1959.** 6 refs., 12 eqs. **DLC**—The author develops a form by means of which it is possible to compute the index of refraction of humid air under a

atmospheric conditions, namely: $\nu = 1 + 2\pi \frac{\omega_e}{mA_eQ} \frac{P}{T}\left(1 - \frac{e}{P} + \frac{A_c\omega_w}{A_w\omega_c}\frac{\delta e}{\rho}\right)$. This formula becomes $\nu = 1 + 0.787.10^{-4}\frac{P}{T}\left(1 - 0.132\frac{e}{P}\right)$ where P and e are in mb and $\nu = 1 + 1.0485.10^{-4} \times \frac{P}{T}\left(1 + 0.132\frac{e}{P}\right)$ where P and e are in mm Hg. A comparison of these exact formulas with $\nu = 1 + c_1\rho$ and $\nu = 1 + c_2\frac{P}{T}$ is carried out. The index of refraction computed by the former is in error by $\Delta\nu = -2.574.10^{-5}\frac{e}{T}$ and by the latter $\Delta\nu = +1.384.10^{-5}\frac{e}{T}$. Accordingly at high humidities the error of indices of refraction may attain in the first case three and in the second two units of the fifth sign. The above magnitudes with reversed signs may serve as corrections to the formulas $\nu = 1 + c_1\rho$ and $\nu = 1 + c_2\frac{P}{T}$, respectively. *Subject Headings:* **1. Radio refractive index calculation 2. Humidity effects on refractive index.**—*I.L.D.*

11.6–260 551.510.52:551.510.62:621.396

Vogelman, J. H.; Ryerson, J. L. et al. (*all, Rome Air Dev. Center, Griffiss A. F. Base, N. Y.*), **Tropospheric scatter system using angle diversity.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(5, Pt. 1):688–696, May **1959.** 18 figs., 2 tables, 7 refs. **DWB**—This paper proposes an extension of the angle diversity technique as a means towards solution of several problems restricting use of over-the-horizon microwave multibeam system as an attack on the problems of transmitter tube limitations, medium to aperture coupling loss, and UHF-band interference. A simple experiment is described and results evaluated. The experiment provides a measure of verification of previous theoretical work on which the proposed technique is based. Results of numerous path calculations are included to provide the reader with an estimate of improvement to be gained by the use of this expansion of the angle diversity technique over a conventional system. *Subject Heading:* **1. Tropospheric radio wave propagation beyond the horizon. I. Bickelhaupt, M. H.**—*Authors' summary.*

11.6–261 551.510.62:538.56:621.396

Bouix, Maurice, **Etude des sources ponctuelles électromagnétiques.** [Study of electromagnetic pin-point sources.] *Annales des Télécommunications*, Paris, 14(5/6):143–150, May/June **1959.** 2 figs., 7 refs., eqs. **DLC**—After reviewing the formulas of the fundamental electromagnetic fields in spherical co-ordinates, the author develops a theorem establishing that the electromagnetic sources may be represented by a lot of "applied" electrical and magnetical streams, which are distributions having as support all of the peculiarities of the Laplacian belonging to one of the electric or magnetic fields. From this are deduced the applied streams corresponding to the electromagnetic field of the stream element, and one investigates the other fundamental electromagnetic fields. This study of electromagnetic pin-point sources should permit an easier introduction of the sources in computation and facilitate more particularly the resolution of certain problems concerned with radiation and diffraction. *Subject Headings:* **1. Electromagnetic pin-point sources 2. Electromagnetic wave reflection.**—*A.V.*

RADIOACTIVITY

See also: **Radioactive fallout data,** 11.6–74; **Radioactive impurities in air** (Aleksandrov), 11.6–76; **Radioactive isotopes** (Goel et al.), 11.6–106; **Radioactive isotopes** (Johansson), 11.6–107; **Fallout predictor** (Bailey et al.), 11.6–245; **Radioactive fallout,** 11.6–285.

11.6–262 551.510.721:551.577.11

Hess, Paul, **Untersuchungen über den Ausfall von Aerosolpartikeln durch Niederschläge und Wolkenbildung.** [Studies on the elimination of aerosol particles by precipitation and cloud formation.] *Germany. Deutscher Wetterdienst, Berichte*, 7(51):67–73, **1959.** 5 figs.,

table, 5 refs., 4 eqs. German and English summaries p. 67. **DWB, DLC**—On principle, three possibilities are known for the separation of radioactive aerosol particles from the atmosphere: 1) sedimentation ("fall-out"), 2) scavenging by precipitation ("wash-out"), 3) cloud pick-up ("rain-out"). By sedimentation (Stokes' law) only relatively large particles (diameter $>30\mu$) are eliminated in up to six days. On the assumption of an average intensity and duration, the precipitation collects particles as small as 5μ. Over against this in clouds (above all by coagulation with cloud elements) are mainly separated small particles (diameter $<0.1\mu$). It can be concluded from this fact that aerosol particles with a diameter of the order of 5 to 0.1μ represent long-lived activity of the atmosphere which, on principle, can only be transported by vertical motions. Such substances therefore are to be found at inversion layers which is true, above all, for the tropopause. In this connection the phenomena of the "blue sun" has to be mentioned. On the assumption of determined heights, cloud layers (amount and height), and intensities of precipitation, the study of models shall show the proportionate elimination of aerosol particles of different sizes in the atmosphere. *Subject Headings:* **1. Radioactive fallout mechanism 2. Aerosol removal 3. Rain removal of radioactive products.**—*Author's abstract.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Gliding weather** (Urfer), 11.6–46; **Effect of Coriolis force on tide propagation** (Valembois, Bonnefille), 11.6–176; **Effect of Coriolis force on sea currents** (Saint-Guily), 11.6–186; **Advection effects on cyclone movement** (Kashin, Gritsenko), 11.6–275; **Stabilization of shifting sand dunes** (Maheut, Dommergues), 11.6–362.

11.6–263 551.511.13

Dufour, L., **Equation générale des transformations pseudo-adiabatiques dans l'atmosphère.** [General equation of pseudo-adiabatic processes in the atmosphere.] *Belgium. Institut Royal Météorologique, Publications, Sér. B*, No. 27, **1959.** 10 p. 3 refs., 28 eqs. **DLC**—Author works out, in this article, the general equation of pseudo-adiabatic processes of saturated humid air. Using in VON BEZOLD's hypotheses, he deduces from this equation the equation accepted by the WMO for representing these processes. Examining those hypotheses shows, however, that they are debatable. Author proposes other hypotheses which, while yielding the same result, are physically acceptable. *Subject Headings:* **1. Pseudo-adiabatic processes 2. Saturation adiabat 3. Equation of pseudo-adiabatic processes.**—*A. V.*

11.6–264 551.511.32:551.509.317

Pichler, H., **Zusammenhang zwischen dem raümlichen und zeitlichen Mittel eines Geschwindigkeitsfeldes in einer autobarotropen Strömung.** [Relation between the spatial and temporal means of a velocity field in autobarotropic flow.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, Vienna, 11(1):18–28, **1959.** 5 figs., 3 tables, 4 refs., 26 eqs. German, English and French summaries p. 18. **DWB, DLC**—Relations between the space and time means of the velocity field in an autobarotropic current are studied by means of a particular integral of the divergence-free vorticity equation. Conditions for a barotropic atmosphere are derived under which time mean and space mean can be considered equal. *Subject Heading:* **1. Barotropic vorticity equations.**—*Author's abstract.*

11.6–265 551.511.6:532

Dodu, Jacques, **Influence des nombres de Weber et de Reynolds sur la dispersion des jets liquides à grande vitesse.** [Influence of Weber and Reynolds numbers on the dispersal of high-speed liquid jets.] *Académie des Sciences, Paris, Comptes Rendus*, 249(4):499–501, July 27, **1959.** 5 figs., 3 refs. **DWB, DLC**—Laboratory of the dispersion of liquid jets in air. The experimental results show that, in the series of tests made, the variation of jets scattering owed to Reynolds number is inferior to the dubiousness of this dispersion determination. Influence of Weber number, on the other hand, seems to be highly preponderant. *Subject Headings:* **1. Flow dynamics 2. Liquid jet dispersal 3. Reynolds number 4. Weber number.**—*A. V.*

11.6–266 551.511.6:532.13

Kao, Shih-Kung (*Calif. Univ., L. A.*), **Turbulent transfer in the boundary layer of a stratified fluid.** *Journal of Meteorology*, Boston, 16(5):497–503, Oct. **1959.** 3 figs., 20 refs., 33 eqs. **DWB, DLC**—In this paper, an analysis is made of some characteristics of the steady turbulent transfer in the boundary layer of a stratified fluid. The effect of the heat flux on the variation of the mixing length and the flux Richardson number with height is determined. The velocity and temperature profiles are derived. It is found that for a constant free-stream velocity an upward heat flux increases the friction velocity, whereas a downward heat flux decreases the friction velocity. The lower limiting value of the flux Richardson number is found to be −0.5 which, together with the upper limiting value, 0.5, obtained by Townsend, gives the range of the flux Richardson number. Velocity profiles for the non-neutral conditions converge in the higher level towards the profile for the neutral condition, a characteristic which agrees with the classical velocity profiles observed by THORNTHWAITE and KASER. *Subject Headings:* **1. Turbulent transfer 2. Stratified fluids 3. Boundary layer turbulence.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **500 mb flow patterns** (Julian et al.), 11.6–315.

11.6–267 551.513:551.509.334:001.1

Kletter, L., **Charakteristische Zirkulationstypen in mittleren Breiten der nördlichen Hemisphäre.** [Characteristic circulation types in mid-latitudes of the Northern Hemisphere.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A.*, Vienna, 11(2):161–196, **1959.** 15 figs., 15 refs. German, English and French summaries p. 161–162. **DWB, DLC**—New principles of classification for large-scale weather situations are outlined in this paper. Hitherto the pressure-field has been taken as a basis for such classifications by conceding a precedence of an unjustified position to semi-permanent centres of pressure. The new classification starts from the field of large-scale motions, which is dissected in elementary models. A statistical test yielded the possibility to reduce all types of atmospheric circulations in the following three elementary models: drifts, waves and eddies. In detail it was found out, that drifts occur in 49%, waves in 23% and eddies in 28% of all cases investigated. In the new classification the term "pressure-field" is substituted by "field of motion" and the expression "large-scale weather situation" by the more comprehensive conception "type of circulation." By that the unjustified priority of pressure-centers in classifying weather situations is abolished. At last the classification of the types of circulation follows from a combination of the three elementary models: drift, wave and eddy. *Subject Headings:* **1. Northern Hemisphere circulation classification 2. Circulation types.**—*Author's abstract.*

11.6–268 551.513:551.571(5)

Murakami, T. (*Met. Res. Inst. Tokyo*), **The general circulation and water-vapor balance over the Far East during the rainy season.** *Geophysical Magazine*, Tokyo, 29(2):131–171, March **1959.** 17 figs., 2 tables, 14 refs., 15 eqs. **DWB, DLC.** Also in: *Journal of Meteorological Research*, Tokyo, 11(6):553–554, June **1959.** In Japanese. **DWB, DLC**—It became clear that during the rainy season there exist four kinds of prevailing wind systems which are called, in this paper, Polar jet, Indian westerlies, Baiu jet and Easterlies, respectively. A well-defined moist tongue extends from southern China across Formosa to the south of Japan. Water vapor transfer is in a large extent controlled by prevailing currents. We observe two pronounced flows of moisture, one being controlled by Indian westerlies, centered at a pressure of about 700 mb level and the other by Easterlies, close to the ground surface. In the early stage of the rainy season, moisture flow accomplished by Indian westerlies plays an important role for shaping the distributions of rainfall. In the last stage, however, moisture flow from the southern Pacific becomes significant. By making use of the data of precipitation and individual change of mixing ratio integrated with respect to pressure, we estimated the amount of evaporation. It appears that evaporation is strongest to the east of Formosa, where evaporation exceeds 15 mm per day. *Subject Headings:* **1. General circulation 2. Water vapor transfer 3. Rainy seasons 4. Far East.**—*Author's abstract.*

11.6–269 551.513.2:551.557.5(98)

Krishnamurti, T. N. (*Chic. Univ.*), **Vertical cross section through the "polar-night" jet stream.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1835–1844, Nov. **1959.** 18 figs., 2 tables, 12 refs. **DLC.** Also in: Chicago. Univ. Dept. of Meteorology, Contract N6ori-02036, Report of Research [unnumbered], March **1959.** 7 p. 18 figs., 2 tables, 12 refs., eqs. **DWB** (M57.2.C532ve)—Due to the great altitude of the core of the "polar-night" jet stream, only isolated rawinsonde observations have penetrated into the core, which renders the construction of synoptic cross sections difficult. For a more definitive determination of the structure of this current all soundings of the North American Arctic were combined into one cross section for a four-day period when the jet stream was in relatively steady state. It turned out that the core was located at a height of 26 km with speed of 135 knots. Below this altitude the atmosphere was isothermal in the mean; above it temperatures increased upward. Cross sections were constructed for the wind components parallel and normal to the jet axis, temperature, potential temperature, absolute and potential vorticity. Comparison was also made between observed and geostrophic wind speeds; a high correlation was found to exist. *Subject Headings:* **1. Arctic jet stream 2. Jet stream structure 3. Vertical cross sections.**—*Author's abstract.*

11.6–270 551.513.2:551.557:551.510.53

Pogosian, Kh. P., **Stratosfernoe struĭnoe techenie v kholodnoe polugodie.** [The stratospheric jet stream in the cold half-year.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:15–21, Feb. **1959.** 4 figs., 2 tables, 2 refs. **DWB, DLC**—In this study of the wind regime and jet streams of the lower stratosphere during the cold half-year 1957–1958, mean vertical sections were constructed between the equator (Nairobi) and the poles (SP-7). The jet currents were found to be characterized adequately by these vertical sections. Thermal wind was calculated for high altitudes. During Sept., Oct. and March, the temperature distribution in the lower stratosphere approaches the isothermal state in middle and higher latitudes. Hence, above the tropopause, wind velocity does not increase with height. In winter, wind velocity increases with height. In the lower stratosphere, except in the equatorial zone, westerly winds weaken with height in Oct.; their decrease in velocity is particularly noticeable at lower latitudes. In the equatorial zone easterly winds prevail at all latitudes; their zone is compressed toward winter and at the 20 km level it includes latitudes 10–15°N. Below the tropical tropopause, situated at 16–17 km, the air temperature is lower at the same levels than at latitudes 40–50°N. The direction of the horizontal gradient of temperature between equator and mean latitudes is reversed between 200 and 160 mb (12–14 km). The axis of the subtropical jet stream lies usually between the subtropical and polar tropopause near 200 mb. Above the axis westerly winds weaken and easterly winds intensify; the latter weaken above 50 mb. In the second half of fall the wind regime in the stratosphere over the extratropic latitude alters gradually and it intensifies over the central regions of European U.S.S.R. In the winter the stratospheric jet streams intensify as a result of increased temperature difference between equator and poles. The characteristics of seasonal variations in temperature and winds between equator and north pole in the jet stream system is discussed with the aid of mean monthly data given in tables. *Subject Headings:* **1. Stratospheric winds 2. Jet stream variations 3. U.S.S.R.**—*I.L.D.*

11.6–271 551.513.2:551.557.34:551.331.5

Yamamoto, Takeo (*Geophys. Inst., Yamaguchi Univ.*), **Relationship of jet stream secular variation to glacier activity.** *Canada. Defence Research Board, Translation T-67-J.* March **1959.** 3 p. 3 figs., 8 refs. **DWB** (M18 Y195re) Transl. from the original Japanese in *Quarterly Research* 1(2):45–48, **1958.**—The advances and retreats of the Alpine glaciers show surprising correspondence to the fluctuations of tree-growth at Mt. Alishan (23°30'N 120°48'E, 2676 m) in Formosa, as shown in Fig. 3. It is supposed that jet stream intensification might cause the retreat of glaciers in the Alps, by activating the lateral mixing of cold and warm air, while in the Far East the stronger jet would depress the amount of summer precipitation brought by the southeastern monsoons, on which tree growth might depend. *Subject Headings:* **1. Glacier variation—jet stream relationships 2. Jet stream variations 3. Formosa.**—*Author's abstract.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane seminars,** 11.6–23; **Waterspout obs.** (Rossmann), 11.6–220; **Typhoon forecasting** (Kadowaki), 11.6–244; **Pressure variations** (Yamamoto), 11.6–301; **Air mass effects on freezing nuclei** (Rau), 11.6–324; **Thunderstorm clouds** (Grenet), 11.6–328.

11.6–272 551.515(672)

Tschirhart, G., **Les perturbations atmosphériques intéressant l'A.E.F. Méridionale.** [The atmospheric disturbances affecting Southern French Equatorial Africa.] *France. Météorologie Nationale, Monographies,* No. 13, June **1959.** 32 p. 35 figs., 4 refs. **DWB**—This monograph is a synthesis of the various knowledges actually established about the atmospheric phenomena affecting the regions lying at inter-tropical latitudes. After a short survey relating to the general circulation in the equatorial regions, author investigates the various types of disturbances affecting these regions. Successive examination of squall lines, almost stationary zonal disturbances, cyclonic convergence disturbances, maritime disturbances with nimbostratus. For every one of these 4 types of disturbances, their origin, various peculiarities, evolution and development, and the conditions required for their appearing and development are investigated. A process of forming is propounded for each of those disturbances. *Subject Headings:* **1. Atmospheric disturbances 2. Intertropical front 3. Squall lines 4. French Equatorial Africa.**—*A. V.*

11.6–273 551.515.1(267)

Ray Choudhuri, S. N.; Subramanyan, Y. H. and Chellappa, R. (*all, Met. Office, Poona*), **A climatological study of storms and depressions in the Arabian Sea.** *Indian Journal of Meteorology and Geophysics,* Delhi, 10(3):283–290, July **1959.** 4 figs., 2 tables, ref. **DWB, DLC**—A climatological study of storms and depressions in the Arabian Sea based on the data of 61 yrs, 1890–1950, is analyzed. During this period, the total number of disturbances was 140 (Table 1) of which 63 were cyclonic storms and the rest (77) depressions. The maximum number of disturbances developing in any one year was 6. These disturbances are traced year by year and month by month. Then yearly and monthly frequency, direction and speed of motion are examined and graphically illustrated. Finally, the average life period of storms and depressions in each month (Table 2) is shown and the probability of a disturbance affecting a particular port has been calculated. *Subject Headings:* **1. Depressions 2. Cyclone 3. Storm data 4. Arabian Sea.**—*I.S.*

11.6–274 551.515.11(51)

Kuei, Pei-lan and Wang, Zuo-shu (*both, Academia Sinica, Peking*), **An analysis of the mechanism of development of a cyclone in northeastern China.** *Acta Meteorologica Sinica,* Peking, 30(2):150–164, **1959.** 14 figs., 7 refs. In Chinese; English summary p. 164. **DWB**—In this paper three-dimensional analysis of an intensely developed cyclone in northeastern China, Dec. 16 to 20, 1957 is presented. It is found that at all levels in the center of this cyclone there is ascending motion during the development. Within the cold dome, there is also ascending motion at all levels. Accompanying development of this cyclone, the ascending motion, divergence and convergence over the center are intensified, and the level of nondivergence subsides and tends towards symmetry. A schematic distribution of vertical motion associated with the formation of an isolated cold vortex are proposed. It shows that the ascending motion centers nearly over the cold center and it rapidly decreases northward to the cut-off area. Due to this type of distribution of ascending motion, the cut-off vortex is formed. Precipitation is concentrated in the area of the cold air dome, which is in agreement with the result of the computed vertical motion. *Subject Headings:* **1. Cyclone development 2. China.**—*Authors' abstract.*

11.6–275 551.515.13:551.515.73:551.511

Kashin, K. I. and Gritsenko, M. V., **Vliianie advektsii razlichnykh sloev atmosfery na peremeshchenie tsiklonov i antitsiklonov.** [The influence of the advection of various layers of the atmosphere on the movement of cyclones and anticyclones.] *Meteorologiia i Gidrologiia,* Leningrad, No. 2:30–35, Feb. **1959.** 4 figs., 4 tables, 7 refs. **DWB, DLC**—An examination

of the direction of displacement of cyclones and anticyclones as a function of advection different atmospheric layers was carried out on the basis of actual data for June–Dec. 19 and Jan.–May and Oct.–Dec. 1956. The movement of cyclones and anticyclones occurr according to a line along which temperature of at least 3°C per 100 km, is observed. T trajectory of the cyclone deviates from the initial position of the temperature break line the direction of movement of warm air and the anticyclone in the direction of movement cold air. Moving cyclones deviate considerably from the line of temperature contrast wh the maximum fall in pressure is the result of advection of warm air associated with other pr sure formations. This occurs most frequently when small temperatures contrast in the cent region of the cyclone, when several lines of temperature break the first of these lines in t replacement of cold by warm air. The velocity of moving pressure structures depends up temperature differences along the lines of temperature break and the magnitude of the pressu gradient in the path of the moving cyclone. Anticyclones having a lower wind velocity mo more slowly than cyclones and the angle of deviations of their trajectory is smaller. Cyclon and anticyclones are characterized by low mobility when they encounter obstacles in the fo of cold air, in the case of the former, and heat advection in that of the latter. The most di cult instances for analyzing and forecasting the displacement of cyclones and anticyclon (with reference to data on the movement of pressure structures) are discussed. *Subj Headings:* **1. Cyclone movement 2. Anticyclone movement 3. Advection effects cyclone movement.**—*I.L.D.*

11.6–276 551.515.2 :77

§Bundgaard, Robert C.; Fletcher, Robert D. and Smith, James R. (*all, Air Weather Serv U. S. A. F.*), **Typhoon-eye cloud patterns as viewed from above.** *Weatherwise*, Boston 12(64–66, April **1959.** 3 figs., ref. **DWB**—The N. A. S. A. with support from the U. S. Weather Service, has been photographing typhoons in the far east from above since 19 by means of a Perkin-Elmer Model 501 tracking camera, to record cloud patterns on 70-m film. The equipment is flown to 10 miles (150,000 ft.) height by U-2 jet aircraft. Th separate typhoons have been photographed this way since Nov. 1957. The first compos photo from above a typhoon was shown in *Weatherwise*, June **1958** (Typhoon "Kit"). T present article shows that photo and the composite photo for "Winnie" July 14, 1958 e of Formosa. On July 15 it crossed Formosa (damage greater than any in past decad Another, "Ida" on Sept. 24, 1958, southeast of Japan, is shown on cover and by synoptic cha The first photo shows spiral bands and secondary vortices. The second shows the spi structure with 8 additional whirls, and the "eye." The third shows the eye but not a spiral bands. Thus, for satellite reconnaissance, the eye can usually be located by spi bands, but with chaotic and broken clouds, though sometimes by a circular region of maxim brightness. A resolution of 1 to 5 miles should serve, but a resolution of 50 miles would ma details needed for locating center of typhoon or hurricane. *Subject Headings:* **1. Typh photography from above 2. Typhoon "Ida" (Sept. 1958) 3. Typhoon "Winnie" (July 19 4. Northwest Pacific.**—*M.R.*

11.6–277 551.51

U. S. Weather Bureau. National Hurricane Research Project, **A model hurricane p for a coastal community.** Its *Report* No. 28, April **1959.** 25 p. 5 charts. **DWB**—The mo community hurricane preparedness plan which follows is intended to offer local authorities cities and communities along the Gulf of Mexico and Atlantic Coasts vulnerable to hurrica suggestions as to planning and organization to minimize hurricane losses. The value of vance planning for effective action in emergencies is widely recognized. Leadership in prepa tion for hurricane emergencies must come principally from local authorities. They di municipal and community planning, control most of the facilities which would be used meeting an emergency, possess the necessary detailed knowledge of the local area, and have immediate responsibility for the welfare of their community and its residents. The princi factor that discourages community hurricane preparedness planning has been the diffic of evaluating the risk of a hurricane disaster. Some coastal cities have not been visited b severe hurricane within the lifetime of most, if not all, their residents. Statistically the to a given locality will be small. On the other hand the destruction wrought by a hurrica

...ien it does occur, can be tremendous and in many coastal areas the potential for loss of life ...d property in a severe hurricane continues to increase year by year. It is therefore believed ...at the time and effort spent in developing and maintaining a realistic community hurricane ...eparedness plan is definitely worthwhile. The hurricane preparedness plan presented ...rein is for a fictitious city, Homeport, in Achilles County, on the Atlantic Coast. The plan ...equally applicable elsewhere. The plan deals with real hazards associated with hurricanes ...d shows what might be done to minimize death and destruction. *Subject Headings:* ... **National Hurricane Research Project 2. Hurricane precautions.**—*Author's abstract.*

11.6–278 551.515.21

*†Malkur, J. S. (*Woods Hole Oceanog. Inst.*) and Riehl, H. (*Chic. Univ.*), **On the dynamics ...d energy transformations in steady-state hurricanes.** *Tellus*, Stockholm 12(1):1–20, Feb. ...60. 9 figs., 11 tables. 21 refs., 42 eqs. **DLC.** Also issued as: *U. S. Weather Bureau, Na...nal Hurricane Research Project Report* No. 31, Sept. **1959.** 31 p. 9 figs., 11 tables, 22 refs., ... eqs. **DWB** (M15.2 U5845r)—A dynamic model of the inflow layer in a steady mature ...rricane is evolved, relating wind speed, pressure gradient, surface shearing stress, mass flow, ...d convergence. The low-level air trajectories are assumed to be logarithmic spirals. With ... is hypothesis, properties such as maximum wind and central pressure are determined through ... oice of a parameter depending on the inflow angle: a moderate hurricane arises with inflow ...gles of about 20°, while 25° gives an intense or extreme storm. Most of this study treats ...e moderate storm. In order to maintain its core pressure gradients, an oceanic source of ...nsible and latent heat is required. As a result, latent heat release in the inner hurricane area ...curs at higher heat content (warmer moist adiabats) than mean tropical subcloud air. The ...at transfer from the ocean and the release of latent heat in the core determine the pressure ...adient along the trajectory, and this prescribes the particular trajectory selected by the air ...nong an infinite number available from the logarithmic spiral family. This selection prin...ple is evolved using recent work on "relative stability" of finite amplitude thermal circula...ons. Of an infinite number of dynamically possible spirals, the one is realized which maxi...izes the rate of kinetic energy production under the thermodynamic constraints, here formu...ted in terms of the relation between heat release and pressure gradient. Finally, rainfall, ...ficiency of work done by the storm, and kinetic energy budgets are examined in an attempt ... understand the difference between the hurricane—a rare phenomenon—and the common ...b-hurricane tropical storm. *Subject Headings:* **1. Hurricane dynamics 2. Energy trans...rmation in hurricanes.**—*Authors' abstract.*

11.6–279 551.515.23(263)

Haggard, William H. (*Off. Climat., U. S. W. B.*), **Where hurricanes begin.** *Weatherwise*, ...oston, 12(4):145–150, Aug. **1959.** 9 figs., 5 refs. **DWB**—The hurricanes of North Atlantic, ...aribbean and Gulf of Mexico which occur in the months from June through October are ...scussed. The beginning of a hurricane, it is pointed out, should be studied in the region ...here the development took place and continued to the full hurricane stage rather than in far ...ore obscure regions. This approach may appear more reasonable when one considers that ...inor disturbances, waves and shear lines are present in quantity on nearly every days' syn...otic charts. The view of GORDON DUNN, the Weather Bureau's chief hurricane officer, is ...entioned. His approach was extended by the author to attempt to locate the point on all ...opical storm tracks from 1899–1957, where the tropical storm first developed. Its results ...e partially reported in the paper. It is admitted that the exact point on its track at which ... storm attained its tropical storm intensity is questionable. Besides, it is difficult to deter...ine precisely where the closed circulation which developed into a tropical storm first appeared. ...ine figures included in the paper show the beginning points of North Atlantic tropical storms ...d hurricanes between 1899–1958. *Subject Heading:* **1. Hurricane development areas.**—*I.S.*

11.6–280 551.515.23:551.577.37:551.579.4(691)

Sabourеau, P., **Propos sur les cyclones et inondations à Madagascar en février et mars ...959.** [Cyclones and floods in Madagascar in February and March 1959.] *Bois et Forêts ...s Tropiques*, Paris, No. 67:3–12, Sept./Oct. **1959.** 1 fig., 8 photos, 3 tables. **DLC**—In ...eb. and March 1959 four exceptionally severe cyclones devastated a wide portion of Mada-

gascar, causing catastrophic floods and deep erosion of the soil. Damage has been made co siderably worse by the deforestation of the plateaus and by the large number of recent clearin on the Eastern slope. These events show how necessary it is to keep up forest cover wherev it fulfils an irreplaceable protective function. A chart shows the paths of the cyclones and t regions where wind speed was higher than 94 km/h. The author gives a report of damag caused by floods, erosion, landslip, etc. Pluviometric recordings during the cyclones are giv in tables. Up to 433 mm were measured in 24 h, 613 mm in 4 days and 1705 mm in Mar 1959. *Subject Headings:* **1. Hurricane damage reports 2. Floods 3. Erosion 4. Rainf intensities 5. Madagascar.**—*A. V.*

11.6–281 551.515.3(7

Beebe, Robert G., **Tornadoes during 1958.** *Weatherwise*, Boston, 12(1):13–16, Feb. 195 3 figs. **DWB**—Tornado occurrences during 1958 took a sharp downward drop as only abo 624 were reported. The number of tornadoes reported is shown on the accompanying ma Nevada, New Hampshire, Oregon, Utah, Vermont, and West Virginia were favored by no tornadic winds. The spring season was unusually quiet, but in June 157 tornadoes were r ported, the second greatest of record, being topped only by 164 in 1957. The number of liv lost was sharply lower with only 59 fatalities. These deaths were caused by 10 tornadic situ tions and three of these accounted for the loss of 50 lives. A detail of more devastating to nadoes is individually given and also a number of unusual incidents reported. For instan Alaska, where very few storms develop reported a tornado at Fairbanks at 1415 CST on Ma 16. California, usually secure from tornadoes, reported 10 tornadoes. Florida ranked eigh in the total number of tornadoes reported with 22. Rensselaer, Indiana was visited by to nadoes twice during the same day on June 8. In South Dakota, where a number of tornado are expected every summer, only one was reported during the entire year. *Subject Headin* **1. Tornado occurrence 2. United States.**—*I.S.*

11.6–282 551.515.3(77

Brancato, G. N. (*U. S. W. B., St. Louis, Missouri*), **St. Louis tornado Feb. 10, 195** *Weatherwise*, Boston, 12(2):43–44, April **1959.** 3 photos. **DWB**—The tornado which stru the outskirts of St. Louis, Mo., on Feb. 10, 1959, at about 0200 and the center of the city b tween 0213 and 0220 was the worst to strike the St. Louis area since 1927. Storm was p ceded by a series of intense thunderstorms producing 1–3 in. of rain and causing flash floods many streams in the area. After these had passed it cleared and then a squall line approach at 30 knots with winds 40–50 km and hail in advance of a Pacific cold front in warm, moist ve unstable air and near the apex of a frontal wave. The tornado crossed the city at 60–65 m.p compared with the squall line rate of 35 m.p.h. Twenty one people were killed, 72 experienc major injuries, 273 minor injuries, and about 1000 dwellings and 1000 other buildings we damaged. Property damage was $10,000,000 and 3000 families suffered loss. Map of ci shows areas affected and photos show damage. *Subject Headings:* **1. Tornado, St. Lou (Feb. 1959) 2. Tornado damage 3. St. Louis, Mo.**—*M.R.*

11.6–283 551.515.3:551.31

Maruszczak, Henryk and Trembaczowski, Jan, **Geomorfologiczne skutki gwałtow ulewy w Piaskach Szlacheckich koło Krasnegostawu.** [Geomorphological effects of a clou burst at Piaski Szlacheckie near Krasnystaw.] *Lublin. Uniwersytet Marii Curie-Skłod skiej, Annales, Section* B, 11:129–160, **1956.** Issued **1959.** 2 figs., chart, 14 photos, 2 tabl 14 refs. English and Russian summaries p. 151–159. **DLC**—The authors worked out a discuss a detailed map of erosional and depositional forms due to a cloudburst on June 1956, in the drainage area of Piaski Szlacheckie, Poland. Rainfall amounted to about 100 m within two hours and caused serious damage. Tables give the length of erosional rills and t volume of material removed from them. The largest rills had a width of 8 m and a me depth of 1 m; 22,509.6 m^3 material were removed (1,432.5 m^3/km^2). Horizontal variati and vertical differences in the erosion rate are investigated and the main deposition for described. Investigation of the cultivated plants in this region shows that clover, corn a particularly grassland are generally most efficient in protecting the soil from erosion, wher potatoes and buckwheat encourage it. *Subject Headings:* **1. Erosion 2. Waterspout effe on erosion 3. Poland.**—*A. V.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Solar energy bibliogs.**, 11.6–44; **Planetary nebulae temps.** (Andrillat), 11.6–77; **Corpuscular radiation** (De Jager), 11.6–82; **Sec. D1**, p. 847; **Night airglow spectra** (Sandford), 11.6–119; **Auroral luminescence spectra** (Murcray), 11.6–123; **Sec. D4**, p. 853; **Solar-geomag. relationships** (Parker), 11.6–136; **Spectral measurement of atmos. structure** (Kaplan), 11.6–213; **Stratospheric radiation** (Dollfus), 11.6–230.

11.6–284 551.521.1:635.64:635.98

de Vries, K. J. (*Inst. for Horticulture, Wageningen, Netherlands*), **De mogelijkheid tot vervroeging van de stooktomatenoogst in moderne kassen.** [The possibility of speeding up the harvest of tomatoes in heated modern greenhouses.] *Landbouwkundig Tijdschrift, Wageningen*, 71(9):273–278, May **1959.** 5 figs., 6 refs. **DA**—Data are given on the daily global radiation energy at Wageningen for the period 1938–1953, especially from Jan. to April. It is calculated that a modern greenhouse transmits 10% more incoming radiation than a Venlo-warehouse type. On the basis of these data, it is theoretically calculated that the planting out and the harvest of early tomatoes may be speeded up by at least four days when cultivated in modern greenhouses. *Subject Headings:* **1. Tomato cultivation 2. Greenhouses 3. Solar radiation effects on plants.**—*A. V.*

11.6–285 620.92:551.521.1 551.510.721:551.510.42

†Maryland. Univ. Bureau of Business and Economic Research, **Solar and atomic energy: a survey.** *Studies in Business and Economics*, College Park, Maryland, 12(4), March **1959.** 21 p. More than 100 refs. **DWB** (621.47 M393so)—Meteorologists, astronomers, chemists, physicists and other scientists in diverse scientific fields have contributed greatly toward solar energy developments, and in the study of its basic characteristics. The enormous quantity of solar energy in the atmosphere as well as its spectral distribution on the Earth's surface and the related factors that have been studied so far are discussed. Photochemistry and photoelectricity, storage and transmission of energy, nuclear fission and fusion, atomic radiation fallout, waste disposal and atmospheric pollution control are also discussed. *Subject Headings:* **1. Solar energy utilization 2. Atomic energy utilization 3. Radioactive fallout 4. Atmospheric pollution control.**—*N.N.*

11.6–286 551.521.11:632.94

Visser, T.; Shanmuganathan, N. and Mulder, D., **The possibility of timing blister blight spraying according to sunshine records.** *Tea Quarterly*, Ceylon, 30(1):39–43, March **1959.** 3 refs. English summary. **DA, CU**—This paper deals briefly with a new method of timing blister blight spraying according to sunshine records. A spray-timing system, based on an average daily sunshine of 3–4 hours recorded over 5-day and 7-day periods, provided adequate protection while reducing the number of spraying rounds by about 40% over a period of about 8 months. This method of spraying shows considerable promise as regards its application on estates. However, it involves some practical difficulties, a few of which are briefly discussed here. *Subject Headings:* **1. Spraying methods 2. Blister blight spraying 3. Solar radiation effects on plant diseases.**—*Authors' abstract.*

11.6–287 551.521.13

Wegener, Kurt, **Die Strahlungskonstante der nicht-schwarzen Welt.** [The radiation constant of the nonblack world.] *Beiträge zur Physik der Atmosphäre*, Frankfurt a. Main, 31(3/4):258–261, **1959.** 2 refs. **DWB, DLC**—A brief article discussing the problem of black body and nonblack body radiation, with special emphasis on albedo of various surfaces, radiation errors involved in the internal mechanism of the measuring instruments, the solar constant and the value of n in KIRCHOFF'S expression for nonblack-body radiation, its variation with air mass, height, cloudiness, etc. *Subject Headings:* **1. Nonblack body radiation 2. Black body radiation 3. Solar constant.**—*M. R.* Ⓢ

11.6–288 551.521.16:581.14

Wellensiek, S. J., **The inhibitory action of light on the floral induction of *Perilla crispa***. *Akademie van Wetenschappen te Amsterdam, Proceedings of the Section of Sciences, Ser. C* 62(3):196–203, **1959.** 4 photos, 3 graphs, 4 tables, 6 refs. **DLC**—Results are presented of investigations regarding the cumulative effect of light-inhibition on *Perilla crispa*, and its action spectrum as well as the periodical effects of periods of darkness, of a night break, and differential temperature treatments during long day. The following picture can be built up 1) In the short day plant Perilla crispa light exerts an inhibitory action on the floral induction Darkness removes this inhibition. The relative durations of light and darkness determine whether the inhibitive light action is removed completely, so that floral induction can take place. If the light inhibition is removed, flowering takes place under all circumstances, provided growth is possible; 2) Periodical night breaks have a similar inhibitory effect as continuous light, however quantitatively much smaller; 3) The maximal light inhibition is reached after 3 days continuous light; 4) The light inhibition takes place in all sources of light studied. No indication of a red-infrared antagonism was found; 5) The induction is not restricted to darkness, but the production of the floral stimulus is delayed by darkness; 6) Differential treatments directly prove the concept that flower bud formation takes place if the inhibitory action of light is removed, in this case by applying long photophases (16 hours) at 20°C, under which circumstances (no light inhibition in the cold) initiation of flower buds occurs. *Subject Headings* **1. Photoperiodism 2. Light effects on plants.**—*A. V.*

11.6–289 551.521.17:551.508.25:535.33

Lenoble, Jacqueline, **Etude du rayonnement ultraviolet du ciel, I, Spectrophotomètre-polarimètre pour le ciel zénithal.** [Study of the ultraviolet sky radiation, Pt. 1, Spectrophotometer-polarimeter for the zenith sky.] *Revue d'Optique*, Paris, 38(6):282–289, June **1959.** 5 figs., 4 refs. French and English summaries. **DLC**—A recording photoelectric spectrophotometer was built to investigate the ultraviolet luminance of the zenith sky. The ultraviolet monochromator and the 20 stages electron multiplier are under a shelter outside the laboratory, while the recorder and power supply are placed inside. The instrument is automatically controlled and can record spectra at several previously selected altitudes of the sun. It has been supplemented with a modulating polarimeter and a compensating plate for measuring the polarized light. *Subject Headings:* **1. Photoelectric spectrometers 2. Ultraviolet radiation.**—*Author's abstract.*

11.6–290 551.521.2:551.521.32:551.525

*†Hales, J. Vern and Zdunkowski, Wilford G., **The long wave flux density leaving the earth under various meteorological conditions.** Intermountain Weather, Inc., Salt Lake City Contract AF 19(604)-2418, Scientific Report, No. 1, Jan. **1959.** 57 p. 6 figs., 27 tables, 35 refs. **DWB** (M(051) I61s)—The long wave thermal radiation flux density leaving the plane earth is determined for various meteorological air masses. Emission of infrared radiation by the surface of the earth as modified by water vapor, carbon dioxide, and ozone is calculated by means of Elsasser radiation charts. The meteorological data used are those given by Petterssen which do not represent climatological means, but certain typical situations. Lacking exact descriptions of the water vapor structure of the stratosphere, flux densities are calculated for two variant conditions, a dry and a moist stratosphere. Little difference results. It is assumed that all air masses, except those of distinctly dry character, might include clouds whose tops are found at one of the following levels: 800 mb, 700 mb, 500 mb, 300 mb, and 200 mb. Hence flux densities are calculated for clear and clouded sky, with the result that cloud top data are found to be extremely important. Since the soundings contain only shelter temperatures whereas soil temperatures are needed, seven different temperatures for the ground are assumed for each individual case. Ground temperature is shown to be very important. *Subject Headings:* **1. Infrared radiation flux 2. Radiation balance of earth 3. Soil temperature effect on infrared radiation.**—*Authors' abstract.*

11.6–291 551.521.32:551.521.18:551.508.822(775

Kuhn, P. M.; Suomi, V. E. and Darkow, G. L., **Soundings of terrestrial radiation flux over Wisconsin.** *Monthly Weather Review*, Wash., D. C., 87(4):129–135, April **1959.** 5 figs

table, 10 refs., 2 eqs. **DWB, DLC.** Also issued as Wisconsin Univ., Department of Meteorology, Contract Cwb-9475, Final Report, June 1959. 16 p. 5 figs., table, 10 refs., 2 eqs. DWB (M(051) W811re)—Results and conclusions drawn from 50 radiometer-sonde ascents over Wisconsin are presented. Atmospheric infrared radiation flux is separated into upward, downward, and net components. Radiation divergence and resulting cooling are computed. Seasonal averages of these direct observations are compared. *Subject Headings:* **1. Terrestrial radiation 2. Infrared radiation flux 3. Radiosonde data 4. Wisconsin.**—*Authors' abstract.*

TEMPERATURE

See also: **Temp. effects on plants** (Pichotka), 11.6–53; **Radiation frost** (Vaupel), 11.6–54; **Temp. changes in cypress logs** (Curry, Griffiths), 11.6–56; **Temp. effects on gravimeter readings** (Murphy), 11.6–155; **Snow melt-temp. relationships** (Poggi), 11.6–199; **Degree-day growing data** (Boughner, Kendall), 11.6–225; **Vertical distribution of freeze-thaw** (Hastenrath), 11.6–300.

11.6–292 551.524:576.8.093

Petru, A. D., **La température dans les lits bactériens.** [Temperature in bacterial beds.] *Centre Belge d'Etude et de Documentation des Eaux, Liége, Bulletin*, 43(1): 21–23, Jan./March 1959. 2 figs. 9 refs. **DLC**—Study of temperature influence on the movement of air in bacterial beds. Measurements have been made for three distinct cases: a) where temperature of air is higher than that of water; b) temperature of water is higher than that of air; c) difference between temperatures of air and water is slight. These experiments have shown that distribution of air temperature within bacterial beds is influenced through many factors: sun, wind, air humidity, etc., as through the form of the bacterial bed. *Subject Headings:* **1. Bacteriology 2. Water temperatures 3. Temperature effects on aquatic micro-organisms.**—*A.V.*

11.6–293 551.524.1:551.571.32(969)

Reber, Grote (*Research Corp., N. Y., N. Y.*), **Temperature and humidity atop Haleakala.** *Australian Meteorological Magazine*, Melbourne, No. 24:73–79, March 1959. 5 figs., ref. **DWB**—This paper discusses temperature and humidity data taken atop Haleakala, Hawaii, during the period July 1952 through Oct. 1954. Temperature variations are found to be about 7°F from summer to winter and from night to day. Freezing occurs up to 38°F due to low humidity, low pressure and radiation loss. Highest humidity occurs near midday caused by thermal updraughts. *Subject Headings:* **1. Temperature-humidity data 2. Seasonal temperature variations 3. Haleakala, Hawaii.**—*Author's abstract.*

11.6–294 551.524.35(234.3)

Hackewitz, Helga v., **Zur Struktur positiver und negativer Temperaturanomalien am nördlichen Alpenrand.** [Structure of positive and negative temperature anomalies at the northern edge of the Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54): 254–265, 1959. 8 figs., 2 tables. German, English and French summaries p. 254. **DWB, DLC**—The author discusses the relation between the mean extremes and the corresponding monthly mean value of temperatures. There is a linear connection between these two elements. Besides, a difference can be noticed as to stations of different heights, and with low stations a difference exists between the winter months and the rest of the year. The results can be explained by the different share of allochthone and autochthone influences. *Subject Headings:* **1. Temperature anomalies 2. Extreme-mean temperature correlation 3. Northern Alps.**—*Author's abstract.*

11.6–295 551.524.35:551.324.6

Holzapfel, Rupert, **Hochsommertemperaturen und Gletscherhochstände.** [Midsummer temperatures and maximum glacier extension.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):27–28, 1959. fig. German and English summaries p. 27. **DWB, DLC**—Overlapping running means of midsummer temperature at Hohenpeissenberg since 1781 and at Zugspitze since 1901 show that each maximum extension of glaciers is preceded by midsummers with

mean temperatures at least 0.5°C below the long period mean. The temperature series, however, do not reveal any secular change of midsummer temperatures which could be connected with the observed secular variation of glaciers. *Subject Headings:* **1. Summer temperatures 2. Glacier variations 3. Temperature effects on glaciers 3. Hohenpeissenberg, Germany 4. Zugspitze, Germany.**—*Author's abstract.*

11.6–296 551.524.36(713):551.501.4

*Thomas, M. K., **Heating degree-days and winter design temperatures in southern Ontario.** *Canada. Meteorological Branch, CIR*-3159, CLI.-18, Feb. 11, **1959.** 15 p. 3 maps (fold.) 5 tables, 19 refs. **DWB, DLC**—Data on heating degree-days (below 65°F) for 65 stations in southern Ontario have been computed and normal, extreme, and probabilities of degree-days and design temps. at 4 levels (1%, 2½%, 5%, and 10%) for selected stations are presented, and their calculation, use and importance outlined in the text. Variability from year to year is stressed. *Subject Headings:* **1. Heating degree-days, Southern Ontario 2. Design temperatures, Toronto, Canada 3. Southern Ontario 4. Toronto, Ontario.**—*M. R.*

11.6–297 551.524.7:551.510.53

Zikeev, Nina A. (S.) (*Off. of Climat., U. S. W. B.*), **Minimum temperatures in the lower stratosphere.** *Monthly Weather Review*, Wash., D. C., 87(7):269–274, July **1959.** 5 figs., 5 tables, 25 refs. **DWB, DLC**—An analysis of the lowest temperatures observed at the base of the stratosphere in various zones of the globe shows that the recent records obtained over the Antarctic lower the previous world record of long standing, which was registered in the equatorial zone at Batavia in 1913. *Subject Headings:* **1. Stratospheric temperature minimum 2. Minimum temperatures.**—*Author's abstract.*

11.6–298 551.524.37:551.509.532(94)

*Vollprecht, R. (*Divisional Office, Perth*), **The occurrence of frost in the Geraldton tomato growing area.** *Australian Meteorological Magazine*, Melbourne, No. 24: 21–24, March **1959.** fig., 9 tables, 2 refs. **DWB**—Since the tomato plant is frost-tender, it is essential in studying the economic productivity of an area to consider its local climate. This paper indicates that there are widespread variations in frost incidence and severity over short distances and also from year to year. The correlation between frost and antecedent weather conditions is demonstrated. In particular it is shown that most frosts are preceded by wind from between east and south. *Subject Headings:* **1. Frost incidence variations 2. Synoptic conditions for frost 3. Australia.**—*Author's abstract.*

SOIL TEMPERATURE

See also: **Water movement in frozen soil** (van Eimern), 11.6–204; **Soil temp. effects on infrared radiation** (Hales, Zdunkowski), **11.6–290.**

11.6–299 551.525:631.4:631.85

Arambarri, P. and Talibudeen, O. (*both Rothamsted Experimental Station, Harpenden, Herts.*), **Factors influencing the isotopically exchangeable phosphate in soils. The effect of temperature in some calcareous soils.** *Plant and Soil*, The Hague, 11(4):364–376, Nov **1959.** 3 figs., 2 tables, 12 refs. **DLC, DA**—The influence of temperature in the range 25° to 45°C on the rate of dissolution and the equilibrium concentration of phosphate, on the labile phosphate and its components, and on the rates of isotopic exchange in four soils with varying $CaCO_3$ contents and phosphate status was investigated. There were abnormal increases in the equilibrium phosphate concentration and the rate of exchange of the slowly labile phosphate of soils of low P status between 35° and 45°C. The slowly exchanging component normally constitutes the greater part of the labile phosphate of the soil. The soils of higher phosphate status, irrespective of their $CaCO_3$ content, did not show this abnormal behavior. The observed difference is connected with the nature and the composition of the basic calcium phosphates associated with the soil calcium carbonate. *Subject Headings:* **1. Soil temperature 2. Soil temperature effects on phosphate exchange in soils.**—*Authors' abstract.*

11.6–300 551.525:551.524.37:551.343(234.3)

Hastenrath, Stefan, **Zur vertikalen Verteilung von Frostwechseln und Frostsrukturböden in den Alpen.** [Vertical distribution of freeze-thaw and soils with frost structure in the Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):288–292, **1959.** 7 figs. German, English and French summaries p. 288. **DWB, DLC**—The distribution of frost structure soils led to the following conception: changes of frost are most frequent in middle altitudes but, being particularly found during the transition seasons and especially coinciding with days of snow cover, they lack morphological effectiveness. In higher altitudes changes of frost are most frequent in summer; they were supposed to be of great morphological efficacy because of a quasi-absence of snow cover (C. TROLL, 1944). The distribution of days with change of frost in air offers an idea of the distribution of the frequency of freezing and thawing on the very surface of the soil. The research proves that in the Alps a summer maximum of days with change of frost without snow cover does not exist in any altitude and that the maximum of the whole year is situated much deeper than the belt of frost structure soils. *Subject Headings:* **1. Vertical frost distribution 2. Freezing days 3. Alps.**—*Author's abstract.*

PRESSURE AND WIND

PRESSURE

See also: **Pressure waves** (Gião), 11.6–172.

11.6–301 551.541:551.515.1

Yamamoto, R. (*Met. Res. Inst., Kyoto Univ.*), **A study of the microbarographic depression- and elevation types, Pt. 2.** *Meteorological Society of Japan, Tokyo, Journal*, Ser. 2, 35(3):160–169, June **1957.** 44 figs., 4 tables, 9 refs., 9 eqs. **DWB, DLC**—Several examples of the Microbarographic Elevation-Type, i.e., Pressure rise of 0.4–2.0 mmHg during 15–60 min accompanied by no appreciable change of weather, are treated and its general characteristics are drawn out. The dispersive internal gravitational wave hypothesis is proposed for the origin of these types. *Subject Heading:* **1. Pressure variations.**—*Author's abstract.*

11.6–302 551.547:551.55

Petrosiants, M. A., **O prostom sposobe otsenki znaka izmeneniia davlenia, obuslovlennogo perenosom sdviga vetra.** [Simple method of evaluating indicators of pressure changes due to the shifting of wind.] *Akademiia Nauk Uzbekskoĭ SSR, Izvestiia, Ser. Fiziko-Matematicheskikh Nauk*, No. 1:75–81, **1957.** fig., 6 tables, 7 refs. Summary in Uzbek p. 81.—A technical paper in which the author establishes, on the basis of calculations, that the height of an isobaric surface increases where the isotachs converge, and it decreases where they diverge. *Subject Headings:* **1. Isobaric surfaces 2. Isotachs 3. Pressure variations.**—*A.M.P.*

11.6–303 526.37:551.547.1:551.501.9(99) 526.94:551.508.822

Gilbert, Jacques; Valtat, Bernard and Garcia, René, **Calcul théorique de l'altitude de la station Charcot (Terre Adélie).** [Theoretical calculation of the altitude of Charcot Station, (Adélie Land).] *Académie des Sciences, Paris, Comptes Rendus*, 249(5):731–733, Aug. 3, **1959.** ref. **DWB, DLC**—A first determination of the altitude at Charcot station was obtained from barometric surveying, from radiosonde data at Dumont d'Urville Base, pressure and surface temperature at Charcot, and winds at these two stations. A second determination of the height above sea-level is based on radio soundings and wind soundings made at both stations. Using these data the following computations were made: a) the altitudes Z' and $Z'+\Delta Z'$ above Charcot of the isobaric surfaces p and $p+\Delta p$, taking into account the altitudes Z and $Z+\Delta Z$ of these surfaces above Dumont d'Urville and the upper winds at each one of these stations; b) the heights h and $h+dh$ above Charcot of these same surfaces, starting from radio soundings at Charcot. The altitude of Charcot is consequently expressed as follows: $Z_c=Z'-h=Z'+\Delta Z'-(h+dh)$. It may be concluded that Charcot Station's height above sea level during the International Geophysical Year is equal to 2407 geopotential meters, i.e., 2403 geometric meters. *Subject Headings:* **1. Altimetry 2. Barometric surveying 3. Radiosonde altitude data 4. Rawinsonde altitude data.**—*A.V.*

11.6–304 551.547.1

Haring, Warren F. and Mears, Atherton H. (*Wallace and Tiernan Inc.*), **Multiple base altimetry.** *Photogrammetric Engineering*, Wash., D. C., Dec. **1954.** p. 814–822. 3 figs., table, refs., eqs. **DWB, DLC**—Assuming that an equal pressure surface is a plane surface, it is possible to determine heights by altimetry using 3 or 4 stations in a triangle or quadrangle, to an accuracy of 2 ft (average error) if stations are not more than 5 mi. apart. Corrections must be made for tilt of the pressure surface, for Mears Number (air temperature and humidity or air density). Results of a field test at Belleville, N. J., under windy conditions (Feb. 12, 1952) are tabulated, showing greater accuracy than single or two-base altimetry gave. Methods are outlined in detail and nomograms and diagrams, theory and calculations presented. *Subject Headings:* **1. Multiple base altimetry 2. Altimetry techniques 3. Belleville, N. J.**—*M.R.*

11.6–305 551.547.2:551.43

Fujita, Tetsuya and Brown, Henry A., **Revised method of pressure reduction.** Chicago. Univ. Dept. of Meteorology, Contract Cwb-8950, Technical Report, No. 4, June **1957.** 8 p. 2 refs., 13 eqs. Also included in the **Final Report,** Pt. 1, issued **1957. DWB** (M15 C532fi)—Various methods of pressure reduction are examined, especially in regard to their reliability in mountainous areas. It is shown that these methods are of little use in mesometeorological studies. As a result a revised method of pressure reduction is developed which is suitable to mesoscale studies regardless of topography. *Subject Headings:* **1. Pressure reduction techniques 2. Orographic effects on pressure reduction 3. Mesoanalysis.**—*Authors' abstract.*

WIND AND TURBULENCE

See also: **Atmos. turbulence—stellar scintillation relationships** (Keller et al.), 11.6–80; **Atmos. turbulence** (Miller, Farnaham), 11.6–255; **Pressure changes due to shifting wind** (Petrosiants), 11.6–302.

11.6–306 551.511.6:551.551:533.6

Blanch, Gertrude and Ferguson, Harry (*both, Aeronautical Res. Lab., Wright-Patterson A F Base, Ohio*), **Remarks on Chandrasekhar's results relating to Heisenberg's theory of turbulence.** *Physics of Fluids*, N. Y., 2(1):79–84, Jan./Feb. **1959.** 4 tables, 3 refs., 6 eqs. **DWB**—Improved numerical results are obtained for the spectrum of turbulence based on Heisenberg's elementary theory during the stage of decay in a nonstationary process, which is discussed in CHANDRASEKHAR'S 1949 paper. The choice of the form of the differential equation is examined from the viewpoint of its sensitivity in numerical computations to variations of the basic parameter. *Subject Heading:* **1. Turbulence theory.**—*Authors' abstract.*

HORIZONTAL AND VERTICAL DISTRIBUTION

See also: **Wind regime, Vienna** (Steinhauser et al.), 11.6–6.

11.6–307 551.553/4:551.501.42

Brogmus, Willi (*Hamburg*), **Über die Reduktion von Windgeschwindigkeitsmessungen über See auf vorgegebene Bezugshöhen nebst Anwendungen.** [Reduction of wind speed measurements at sea to given basic heights, and applications.] *Annalen der Meteorologie* Hamburg, 8(11/12):327–335, **1959.** fig., 4 tables, 12 refs., 18 eqs. German and English summaries p. 327. **DWB, DLC**—In this paper general equations are derived for the reduction of measurements of wind speed to fixed basic heights. After empiric determination of constant values contained in the equations due to produced wind profile measurements their use is being explained and discussed with the aid of an example (wind speed equivalents of the Beaufort scale from observations of German and Dutch lightships). *Subject Headings:* **1. Wind speed estimation at sea 2. Reduction of wind measurements.**—*Author's abstract.*

SPECIAL WINDS

11.6–308 551.555.6(78) 551.578.4

Brunk, Ivan W. (*U. S. W. B., Chicago, Ill.*), **Another blizzard of 1888.** *Weatherwise*, Boston, 12(2):62–63, April **1959. DWB**—On Jan. 12, 1888, a blizzard which took the lives of several hundred settlers occurred in the Northern Plains. It came southeast from Montana into the Dakotas and Nebraska, causing temperature drops of 30 to 60°F in 24 hrs and readings of −20° to −40°F in South Dakota. Drifts were 5 to 20 ft. deep. Many children perished as the blizzard hit in the daytime. Another note mentions artificial snow for ski resorts produced by machines using water and compressed air, in a few hours over an area 300′ × 500′. Temperatures should be 15° to 20°F and wind nearly calm, though the snow can be made if temperature drops to 28°F. Type and color of snow can be varied at will. Snow rollers are also discussed. A number formed at Aurora, Ill. on Jan. 7, 1957 on nearly level ground. *Subject Headings:* **1. Blizzard, Northern Plains (Jan. 1888) 2. Artificial snow machines 3. Snow machines 3. Snow rollers 4. Northern Plains States.**—*M.R.*

WIND EFFECTS

See also: **Wind effects on forest fires** (Bruneton), 11.6–60; **Wind power utilization,** 11.6–66; **Wind power** (Golding), 11.6–67; **Wind power utilization** (Golding, Thacker), 11.6–68; **Wind power research** (Frenkiel), 11.6–69; **Wind power utilization** (Kolodin), 11.6–70; **Wind machines** (Shevko), 11.6–71; **Wind generation of elec.** (Vadot), 11.6–72; **Wind effects on water surfaces** (Franceschini), 11.6–170; **Shear stress on water** (Vines), 11.6–171; **Wind effect on beach erosion** (Vollbrecht), 11.6–173; **Wind wave profiles** (Schooley), 11.6–181; **Wind waves** (Chigirinskiĭ), 11.6–182; **Wind driven currents** (Bogdanova, Kropachev), 11.6–184; **Wind driven currents** (Evans), 11.6–185; **Wind effects on water surface slope** (Lisitzin), 11.6–187; **Wind effects on sea level** (Weenink), 11.6–188.

11.6–309 551.556.2(43)

Kaiser, Heinz, **Die Strömung an Windschutzstreifen.** [Air flow near shelter belts.] *Germany. Deutscher Wetterdienst, Berichte*, 7(53), **1959.** 36 p. 25 figs., 2 tables, 64 refs., 5 eqs. German and English summaries p. 3. **DWB, DLC**—The intensified meteorological research of wind shelters in Germany in the last decade is presented. This research was stimulated by deflation, caused by extensive deforestation, with production losses up to 10%, in northern lower Saxony, in parts of Schleswig-Holstein and Westphalia, during the drought of 1947 and 1949. An extensive analysis of the leeward air flow at shelter belts is presented by means of mathematical derivations, experiments with model hedges in a wind channel, and observations at shelter belts in the open field. The only quantitative discrepancies in the results of calculation, experimented under simplified conditions as against the more complex natural occurrences, resulted in the following parameters: 1) resistance coefficient of the wall; 2) the roughness of the boundary surface; and 3) the thermic stratification of the atmosphere. The theory was applied to 1) quantitative differences between experiments and observations on leeward flow; 2) the resistance coefficient of previous walls; 3) the shearing strain leeward of a wall; and 4) the structure of shelter belts with optimum effectiveness. These results led again to research of turbulence conditions and on the effects of the form of impediments on leeward air flow. *Subject Headings:* **1. Air flow behind obstacles 2. Shelter belt effects 3. Germany.**—*W.N.*

11.6–310 551.556.4:551.579:551.311.2/3

†Corbel, J. (*Inst. de Géographie, Lyons*), **Vitesse de l'érosion.** [Speed of erosion.] *Zeitschrift für Geomorphologie*, Berlin, 3(1):1–28, Feb. **1959.** 2 tables, 138 refs. German and English summaries p. 23–24. **DWB**—The investigation concerns the amount of final denudation by which the rock waste has been transported from the area of the slopes and depressions explored. Thereby the author discerns between the materials having been removed by mechanic levelling (by suspension and movements at the bottom of the rivers) and by solution. The transported masses are divided by the specific gravity of the parent rock (2.5). The formula indicating the amount of denudation by cub.m per annum per sq km or by mm per

millenium runs as follows: Solids contents in ppm $\frac{X}{25}$ average high of the water-runoff in dn

There is to be considered a fundamental difference between lowlands with soft slopes and hig denudation and areas with steeper slopes and pronounced levelling. In any case the glaci wearing away is essentially more important than the fluvial one. Investigation stimulate especially by considering the amount of denudation notes differences in the rate of denudatio of different climatic areas where denudation affects the same kind of limestones or silicat rocks, respectively. The rate of total denudations by water courses (cub m/annum/sq k respect. mm/1000 years) is varying as follows (the percentage indicates the portion of duneda tion by solution). 1) Lowlands: a) Climate with cold winters 29; 93%; b) Intermediat maritime climate (Lower Rhine, Seine) 27; 83%; c) Hot-dry climate (Mediterranean,Ne Mexico) 12; 10%; d) Hot-moist climate with dry season 32; 34%; e) Equatorial climat (dense rain forest) 22; 70%; 2) Mountains: a) Semi humid periglacial climate 604; 34% b) Extreme nival climate (SE Alaska) 800; 24%; c) Climate of Mediterranean high mountai chains 449; 18%; d) Hot-dry climate (SE U.S.A., Tunisia) 177; 4%; e) Hot-moist climate 92 33%. *Subject Headings:* **1. Erosion 2. Denudation 3. Wind effects on erosion 4. Runo effects on erosion.**—*Author's abstract.*

11.6–311 551.556:551.582.3(73) 551.556.6:6

Brekke, Guttorm N., **Wind pressures in various areas of the United States.** *U. S National Bureau of Standards, Building Materials and Structures Report,* No. 152, April 2 **1959.** 8 p. figs., 3 tables, 11 refs., 10 eqs. **DWB** (691.082 U58b)—A procedure is describe for developing a wind-pressure map that shows minimum resultant wind pressures (30 ft abov ground) for design purposes throughout the continental U. S. This map was used in the 195 revision of the American Standards Association's Standard A58.1, **American Standard Buildin Code Requirements for Minimum Design Loads in Buildings and Other Structures.** (Ob tainable from the American Standards Association, 70 East 45th St., New York 17, N. Y $1.50 a copy.) It is based on records of annual fastest-single-mile wind speeds at 155 U. S Weather Bureau stations. In computing resultant wind pressures from these data, allowanc was made for gusts and for building shape. Values for 15 of the stations were also adjuste for altitude or for unusual local wind conditions. A table of design wind pressure at variou heights from less than 30 to more than 1,200 ft above ground is derived for use with the ma The principal sources of strong winds affecting building constructions are briefly reviewe *Subject Headings:* **1. Wind mapping 2. Wind pressure map, U. S. 3. United States.**—*Autho abstract.*

UPPER AIR WINDS

See also: **Upper level wind measurement techniques,** 11.6–216; **High level winds** (Mantis), 11.6–228; **Tropopause—jet stream relationships** (Miller, Farnham), 11.6–255; **Jet stream structure** (Krishnamurti), 11.6–269; **Stratospheric winds** (Pogosian), 11.6–270; **Glacier variation—jet stream variation** (Yamamoto), 11.6–271.

11.6–312 551.55

Charles, B. N. (*Systems Analysis Div.*), **Upper-wind statistics from USWB-FCDA data final report.** U. S. Weather Bureau-Sandia Corporation, Contract AT-(29-1)-789, Co-opera tive Project in Climatology, [unnumbered report, **1958?**] 15 p. 4 tables, 3 refs., eqs. **DW** (M57 U587up)—This is a final report on computations of upper-wind statistics conducted as cooperative effort of the U. S. W. B. Office of Climatology and Sandia Corporation Departme 5120. It describes the statistical parameters computed from the basic data, which consisted each daily 1500Z wind during a 5-year period at 13 pressure levels (from 950 to 30 mb) at 5 (mostly North American) stations. The computations include seasonal (and some monthl mean zonal, meridional, and vector winds and wind shears and their standard deviation Mauchly ellipticity statistics, correlations between winds separated in time and space, a vertical relationships of wind as shown by contingency tables. The resulting 6000 pag (approximately) of tabulations which have been forwarded separately to the U. S. W. B. shou be of value in further studies involving wind climatology and large-scale atmospheric turbulenc *Subject Heading:* **1. Upper air winds.**—*Author's abstract.*

11.6–313 551.557:519.241.1

Charles, B. N., **Empirical models of interlevel correlation of winds.** Albuquerque, New Mexico, Sandia Corporation, (1959?) 8 p. 2 figs., 4 tables, 8 refs., 3 eqs. **DWB** (M57 C475) Also issued in *Journal of Meteorology*, Boston, 16(5):581–585, Oct. 1959. 2 figs., 4 tables, 8 refs., 3 eqs. **DWB, DLC**—Seasonal correlation coefficients between wind components at each of 13 pressure levels (ranging from 950 to 30 mb) have been computed for 51 stations, from a unique upper wind data collection of the U. S. W. B. These statistics are averaged for stations in designated latitude bands, in summer and winter, and presented for use as models in studies involving vertical coherence of wind. *Subject Headings:* **1. Upper air wind correlations 2. Statistical studies of winds aloft 3. Correlation coefficients.**—*Author's abstract.*

11.6–314 551.557.2:551.557.36 551.557.5

Bérenger, M. and Heissat,—(*Météorologie Nationale, Paris*), **Contribution à l'étude de la variation saisonnière des jets.** [Contribution to the study of the seasonal variation of jets.] *La Météorologie*, Paris, Ser. 4, No. 53:11–23, Jan./March **1959.** 15 figs. French, English and Spanish summaries p. 11. **DWB**—A study is presented on the jet stream axes and their fluctuations in Jan. (cold season) and July (warm season) over Europe, French North Africa and the Atlantic. The authors have calculated the frequencies of the occurrence of jet stream axes for 1955, 1956 and 1957, and also of the subtropical jet stream. This calculation reveals the existence of other important jets linked to the polar front in moderate regions. Two charts (Jan. and July) show the frequency of occurrence of jet axes (per thousand) without taking account of direction. Other charts give the frequency of occurrence of jet stream axes, for Jan. and July, according to the 8 principal directions: NW, W, SW, S, SE, E, NE and N. These charts show clearly the general configuration of jets and give a general view of the distribution of jets in the areas considered. Also the principal jet axes are shown, and their width is proportional to their occurrence frequencies. Two principal axes occur in Jan.: the first from the south of Greenland to Iceland, Ireland, the Gulf of Genoa and Cyrenaica where it joins with the subtropical jet; the second from southwest over the Atlantic with a dispersion of 60°N, off Scotland. In July, three axes are noticed: 1) from SW and spreading over Iceland; 2) NW from the south of Greenland to NW Portugal and 3) from the NW of Scotland, towards Sardinia where it joins the subtropical jet. *Subject Headings:* **1. Upper air wind distribution 2. Upper air wind frequencies 3. Jet streams.**—*A. V.*

11.6–315 551.557.2:551.513.2

Julian, Paul R.; Krawitz, Lowell and Panofsky, Hans A. (*all Dept. of Met., Penn. State Univ., Pa.*), **The relation between height patterns at 500 mb. and 100 mb.** *Monthly Weather Review*, Wash., D. C., 87(7):251–260, July **1959.** 20 figs., 13 refs. **DWB, DLC**—The flow at 500 mb is compared with that at 100 mb. With the exception of the polar vortex, the patterns at the two levels tend to show a distinct similarity, with the major exception that small-scale features at 500 mb are not present at 100 mb. In middle latitudes, the wind speeds at the two levels are of the same order of magnitude, with a systematic excess of the 100 mb speeds over the 500 mb speeds at latitudes 30° and farther south. In the region of the polar vortex, heights at the two levels are still well correlated. Variations in height over long periods tend to be much larger at 100 mb than at 500 mb. Similarly, the winds at 100 mb are much stronger than those at 500 mb. *Subject Headings:* **1. 500 mb flow patterns 2. Upper air wind variations.**—*Authors' abstract.*

11.6–316 551.557.3

Cluff, Frank D., **A study of the time variability of integrated winds near Las Vegas, Nevada.** Thesis (Master of Science) University of Utah, Dept. of Meteorology, March **1957.** 1 p. 6 figs., 5 tables, 6 refs., 2 eqs. Photostat of typescript. **DWB** (M57.3 C649st)—This study of the time variability of integrated winds near Las Vegas, Nev. indicates that the angular variation of wind for any given time interval, decreases as the measuring thickness increases and is less with higher wind speeds. There is greater time stability if the speeds are integrated through vertical depths of 600 ft. Surface boundary conditions have little effect on the mean integrated wind speed variability. *Subject Headings:* **1. Upper air wind variability 2. Las Vegas, Nevada.**—*N. N.*

11.6–317 551.557

Arakawa, Hidetoshi (*Met. Res. Inst., Tokyo*), **The world's strongest winds as revealed b Tateno relay-method soundings.** *American Meteorological Society, Bulletin*, 40(7):343–33 July **1959.** 6 figs., 2 tables, 6 refs. **DWB, DLC**—Upper winds over Japan during the win are known to be stronger than at any other place in the world. Here, analysis for the Tate relay-method soundings over three winters is presented. Frequency of maximum wind spe in 100-m intervals of height and in 10-m/sec intervals of speed and directional distribution maximum wind speed are given. Strong vertical wind-shear data observed are also studie *Subject Headings:* **1. Strong upper air wind analysis 2. Strong wind frequencies 3. Japan.** *Author's abstract.*

VERTICAL MOTION

See also: **Gliding weather** (Urfer), 11.6–46; **Wave clouds** (George), 11.6–329

11.6–318 532.5:551.558

Fultz, Dave (*Univ. of Chicago*), **A note on overstability and the elastoid-inertia oscillato of Kelvin, Solberg and Bjerknes.** *Journal of Meteorology*, Boston, 16(2):199–208, April 195 7 figs., table, 27 refs., 8 eqs. **DWB, DLC**—Results elucidating the mechanism by which ov stable (oscillating) cellular convection occurs in rotating layers are given. There is a clo connection with the elastoid-inertia oscillations in a rotating cylinder discussed by KELVI SOLBERG, and BJERKNES, and it is found that diffusion of heat by conduction acts in a destabili ing way in the motion. Simple experiments in a rotating cylinder on the elastoid-inert oscillations show a remarkably close agreement with the free periods, calculated theoretical This, in the field of meteorological experiments, is important in establishing close agreeme with meteorological theory in a situation where the flow can be strongly ageostrophic. *Su ject Headings:* **1. Cellular convection 2. Overstability 3. Elastoid-inertia oscillations Rotating cylinder experiments.**—*Author's abstract.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See: **Water vapor absorption** (Buettner), 11.6–63; **Stratospheric humidity** (Dollfus), 11.6–230; **Water absorption by hair** (Papai), 11.6–232; **Humidity effects on refractive index** (Kazanskiĭ), 11.6–259; **Temp.-humidity data** (Reber), 11.6–293.

EVAPORATION AND EVAPOTRANSPIRATION

See also: **Water vapor transfer** (Murakanii), 11.6–268.

11.6–319 551.573:547

Neish, S. G.; Orr, M. S. and Spensley, P. C. (*Tropical Products Inst.*), **Methods for t reduction of evaporation from water surfaces.** *Tropical Science*, London, 1(2):107–111, 19 8 refs. **DLC, DA**—In tropical and arid zones, evaporation from lakes and reservoirs m amount to 12 in. per month. Investigations concerning the practical use of monolayers form by hexa- and octadecanol (cetyl alcohol) to reduce evaporation from large water surfaces a discussed. The monomolecular films are produced by and regenerated from solid cetyl alcol or cetyl alcohol in solution. Advantages and disadvantages of both methods are investigat especially in relation to the wind. Results of tests in reducing the rate of evaporation fr reservoirs in several countries are given, together with the cost of the water saved per acre a per gallons of water saved. *Subject Headings:* **1. Evaporation reduction from reservoirs a from lakes 2. Cetyl alcohol.**—*A. V.*

CONDENSATION

See also: **Cloud physics conf.**, 11.6–24; **Icing data** (Maška), 11.6–73.

11.6–320 551.574.1:551.578

Isono, Kenji (*Geophysical Institute, Tokyo Univ.*), **Microphysical processes in precipitat mechanism.** *Japanese Journal of Geophysics*, Tokyo, 2(2):1–57, Feb. **1959.** numerous fi

merous plates, 5 tables, 104 refs. eqs. **DWB**—In Ch. I, the results of examination of cloud d fog nuclei, especially of sea salt nuclei, with electron microscope and with the aid of micro- raction method are presented. The process of production of sea salt nuclei is discussed. Ch. II, the processes of ice-crystal formation in the air are discussed. There are solid clei such as AgI, whose effectiveness as ice-forming nuclei can be explained by the oriented ergrowth of ice-crystals on them, but there are many substances such as $AgNO_3$, CdI_2 which ve as freezing nuclei and whose effectiveness cannot be explained by the oriented overgrowth. e importance of surface effect in the process of freezing of micron-sized water droplets is cussed. In Chapter III the results of experiments on the habit and the growth rate of ice- stals formed in the atmosphere are presented with the discussion about the controlling tors of the habit and the growth rate. *Subject Headings:* **1. Ice nuclei formation 2. Nuclea- n processes 3. Sea salt nuclei.**—*Author's abstract.*

11.6–321 551.574.1:551.510.42:546.72(26)

Soulage, G. (*C. N. R. S., Observatoire du Puy de Dôme*), **Hauts pouvoirs glaçogènes dus à concentration de fumées sidérurgiques au-dessus de l'océan.** [High ice forming powers e to the concentration of iron-works smoke over the ocean.] *Annales de Géophysique*, ris, 15(4):461–480, Oct./Dec. **1959.** 9 figs., 14 refs. French and English summaries p. 461. **LC**—The ice forming power of air in the Basque country occasionally displays very high lues which may reach 100 times those normally encountered. These high ice forming powers e due to the accumulation of terrestrial smoke under conditions suitable for their activation for the preservation of their ice forming activity. They occur when there is a temperature version near the ground accompanied by slight winds blowing generally from the sea. The oke giving rise to these high values come chiefly from blast furnaces and steel works which ust thus be considered as important sources of atmospheric ice nuclei. This article describes detail the measurements and observations which lead to this result together with the tech- ques employed to measure the ice forming power and to study iron-works nuclei. *Subject adings:* **1. Atmospheric ice nuclei 2. Nuclei formation over oceans 3. Iron works nuclei.**— *uthor's abstract.*

11.6–322 551.574.11

Bernasconi, Sergio and Gotsch, Georg (*Locarno-Monti*), **Über die Kondensation verschie- ner Dämpfe bei adiabatischer Expansion.** [Condensation of various types of vapor in the esence of adiabatic expansion.] *Zeitschrift für Angewandte Mathematik und Physik*, Basel,)(5):509–519, Sept. 25, **1959.** 9 figs. (incl. photos), 10 refs., 4 eqs. English summary p. 519. **LC**—In accordance with KOHLER'S theory, considerable supersaturation is needed to get e entire body of condensation nuclei to grow into droplets; the degree of saturation is deter- ined by the size of the individual nuclei and their solubility in the condensed liquid. Since is known that in expansion meters all the atmospheric particles which count as condensation uclei do in fact grow into droplets, it may be assumed that the designated supersaturation the expansion chambers is achieved for at least a short space of time. The formation of the eoretically correct degree of supersaturation requires, however, that once the moisture satura- on has been exceeded condensation should markedly lag behind pressure variation, in order allow time for the requisite supersaturation to develop. Experiments designed to test this uestion have established that condensation follows extraordinarily quickly on variation of ressure after moisture saturation has been exceeded. Condensation is also virtually ninfluenced by the choice of vapor used. At very high expansion speeds the condensation rocess is governed by the operative laws of diffusion. Measurements indicate that the egrees of supersaturation occurring in the expansion chambers lie considerably below the vel of critical saturation even for the smallest nuclei. *Subject Headings:* **1. Supersaturation . Condensation nuclei 3. Droplet formation.**—*Authors' abstract.*

11.6–323 551.574.11:546.212(26)

Brier, Glen W. and Kline, Dwight B. (*both, Off. Met. Res., U. S. W. B.*), **Ocean water as a ource of ice nuclei.** *Science*, Wash., D. C. 130(3377):717, Sept. 18, **1959.** fig., 11 refs. **LC**—Preliminary tests indicate that ocean water may release an abundance of ice nuclei the atmosphere. These results may explain the observation that marked anomalies often ccompany an influx of marine air in the Washington, D. C., area and the fact that abnormal

counts are often associated with widespread precipitation. *Subject Headings:* **1. Ice nucl formation 2. Nuclei and maritime air 3. Rainfall-ice nuclei relationships 4. Washingt D. C.**—*Authors' abstract.*

11.6–324 551.574.11:551.51

Rau, Walter (*Max-Planck Inst. Aeron. Stratosph. Weissenau/Württbg.*), **Schwankung des Gefrierkerngehalts der Luft in Weissenau in den Jahren 1953 bis 1957.** [Variations the freezing nuclei content of air at Weissenau, 1953–1957.] *Meteorologische Rundsch* Berlin, 12(3):65–73, May/June **1959.** 13 figs., 7 refs. **DWB, DLC**—The daily determinatio by means of a 30:1 cloud mixing chamber, of the freezing nuclei content of the atmosphere ne the ground in Weissenau begun in 1953, were continued to the end of 1957 in order to confi the fluctuations of freezing nuclei concentration observed during the first fourteen mont The experimental procedure for determining the spectrum of distribution of freezing nuc for given temperature T^* and the construction of the cloud mixing chamber are describe Graphs showing the freezing nuclei collected in the years 1952–1957, represented by temperatu T^* (for concentration 10 freezing nuclei per cm^3) are presented and analyzed. Local conditio as well as meteorological factors do not manifest any direct effects upon the freezing nucl The freezing nuclei wind rose in particular does not show any preferred directions whereby marked anthropogenic origin of freezing nuclei is eliminated. A decisive influence in t freezing nuclei content is the air mass at the place of measurement; subtropical air mass contain only the very late occurring freezing nuclei with ice forming temperatures of −32 and lower. The early occurring freezing nuclei are advected by fresh polar air masses in co centrations up to 10 freezing nuclei per 1 cm^3 during ice forming temperatures of −18° Between continental and maritime air of moderate latitudes there was no difference that cou be attributed to the corresponding land or sea origin of the freezing nuclei. The dependen upon the air mass could be recognized during the entire measurement period in the case of t pronounced weather situations in the daily values and could be established statistically the total observational material. Also the annual variation of freezing nuclei concentrati with a marked winter maximum and an equal summer minimum, which is repeated with varyi amplitude in individual years, is attributable to the air mass distribution. It runs antiparal to the annual variation of temperature and precipitation or precipitation frequency. The lo period concentration changes are explained on the basis of precipitation activity by differen in the general circulation. *Subject Headings:* **1. Freezing nuclei and weather 2. Air ma effects on freezing nuclei.**—*I.L.D.*

11.6–325 551.574

Welander, Pierre (*Inst. Theoretical Physics, Univ. Stockholm & Internatl. Meteor. I Stockholm*), **A theoretical power-law for the size distribution of small particles or drops falli through the atmosphere.** *Tellus*, Stockholm, 11(2):197–201, May **1959.** 3 figs., 4 re 17 eqs. **DWB, DLC**—A theoretical study is made of the size distribution of small partic or drops in the atmosphere as produced by vertical motion and coalescence. It is demonstrat that a power-law distribution is a possible solution both in the time-dependent case, when c ditions are assumed to be spatially homogeneous, and in the steady state case. The the is in special applied to cloud droplets falling and coalescing under the effect of gravity a Stokes friction. In this case it is found that the frequency distribution falls off as r^{-5} in time-dependent case and as r^{-3} in the steady state case, r being the radius. A compari with observed size distributions of droplets in the range 20–80 microns given by WEICKMA and AUFM KAMPE indicates that, on an average, the r^{-5} distribution and r^{-3} distribution reasonable approximations for fair weather cumulus clouds and for cumulus congestus cumulonimbus clouds, respectively. In the time-dependent case the theory predicts that concentration of droplets of a given size should change inversely to a linear function of ti After a definite time T, infinite concentrations are reached and the model breaks down. T characteristic growth time is inversely proportional to the initial concentration of partic For the mean concentration of cloud droplets given by WEICKMANN and AUFM KAMPE, T ta on values of the order 150 seconds, assuming that only droplets which differ in radii less t 10 times coalesce. *Subject Headings:* **1. Droplet coagulation 2. Drop growth theories Drop size distribution in clouds.**—*Author's abstract.*

11.6–326 551.574.14:536.421

†Kachurin, L. G., **Sravnenie razlichnykh uravneniĭ zamerzaniia pereokhlazhdennykh vodnykh aerozoleĭ.** [Comparison of various equations of freezing of supercooled aqueous aerosols.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 1:122–130, Jan. **1959.** 5 figs., 2 tables, 30 refs., 15 eqs. **DLC**—The freezing of individual aerosol drops consists of two stages, namely: the formation of heterophasic ice nuclei and their further growth. The possibility of computing the probability of formation of heterophasic ice nuclei in supercooled water is determined according to the formula $\omega = \exp\left(C - \frac{u}{kT} - \frac{4\pi r^2\sigma}{3kT}\right)$ when $r = \frac{2\sigma\mu}{N\rho L \ln \frac{T_0}{T}}$ and it is shown that there are several variants for ω, since for each of them there are different ways for determining the parameters C, u, σ, etc. The probabilities of formations of heterogeneous nuclei computed by the various methods are presented in curves and compared. They show a sharp decrease in probability of supercooled clouds and fogs during temperatures of from −15° to −20°C. At these temperatures there is established a characteristic potential barrier which can be overcome at lower temperatures of water either by insignificant mass or by very rapid cooling. In order to determine more definitely the possible limits of supercooling of aqueous aerosols the freezing of droplets under different temperatures was computed by assuming a fixed number of drops and calculating the rate of freezing and the time it takes a given part of the total number of drops to freeze. The equation for this computation is developed and it is shown that even a rough measurement of the rate of freezing would give definite estimates of the value of C, a constant depending upon temperature, $c = \ln \frac{nkT}{h}$. Actual meteorological observations indicate that the range of temperatures most characteristic for intense formation of ice particles in clouds and fogs is limited by temperatures between −10° and −20°C. *Subject Headings:* **1. Supercooled water drops 2. Ice nuclei formation 3. Freezing water droplets.**—*I.L.D.*

11.6–327 551.574.2:543

Koenig, L. Randall, **The chemical identification of silver iodide ice nuclei.** Chicago. Univ. Dept. of Meteorology, Cloud Physics Laboratory, Grant NSF-G4644, Technical Note No. 19, June 15, **1959.** 39 p. 13 figs. (incl. photos), 15 refs. **DWB** (M74.1 CS32te)—This report describes a method of chemically identifying silver iodide particles within ice crystals and discusses the results of this test on laboratory ice crystals nucleated by means of silver iodide. *Subject Headings:* **1. Silver iodide nuclei 2. Chemical analysis of condensation nuclei.**—*Author's abstract.*

CLOUDS

See also: **Cloud forecasts** (Houy), 11.6–50; **Cloud water content measurement** (Simidchiev), **11.6–229.**

11.6–328 551.576.1:551.515.4 551.594.21:551.515.4

Grenet, G. (*Inst. de Physique du Globe d'Alger*), **Le nuage d'orage : machine électrostatique.** [Thunderstorm cloud: electrostatic engine.] *La Météorologie*, Paris, Ser. 4, No. 53:45–53, Jan./March **1959.** 4 figs., 13 refs. French, English and Spanish summaries p. 45. **DWB**—A review is presented of some theories relating to the mechanism of cloud charge and a review is given of some generalities concerning atmospheric electricity and charge of fair weather clouds (conductibility and electric field near the soil, ionization radiation, ion recombination, influence of atmospheric pollution). In the second part, the author sets forth his electrostatic theory of thunderstorm clouds, which is parallel with the theory of R. VONNEGUT. In the first stage, the thunderstorm cloud possesses a positive internal charge ranging about one coulomb and an equal negative surface charge. Afterwards, a negative charge accumulation in the lower part of the clouds is made possible by down-draft, and finally the electrification process is accelerated by Corona effect. The author shows some results of the experiments of VONNEGUT and his collaborators. These results are an excellent argument in favor of the electrostatic theory of thunderstorm clouds. These arguments are not conclusive, and only

the surface charge of thunderstorm clouds is a fact which can only exert an important act in cloud electrification formation. *Subject Headings:* **1. Thunderstorm clouds 2. Thund storm electricity.**—*A. V.*

11.6–329 551.576.11:551.558.21(429.

George, D. J. (*Met. Office, Gloucester*), **A persistent wave cloud over North Breconsh April 13, 1958.** *Weather*, London, 14(7):233–236, July 1959. 4 figs., 3 refs. **DWB**— lenticular cloud was observed from a position of 3¼ mi northwest of Llanwrtyd-Wells. It w remarkable for the length of time it persisted in the same position. In the morning the clo was visible from the Irjon Valley when the upstream edge of the cloud was vertically abo the observer and the downstream edge was obscured by the mountain side. The cloud w north-northwest to south-southwest and had the characteristic foliation of a lenticular. the afternoon the stream edge had moved down wind and the vertical extent seemed to ha decreased. At 1540 GMT there were distant isolated banks of lenticular clouds to the nor northwest. The center of the cloud was dense and the weather fair and hazy. An anticyclo was centered west-southwest of Valentia. An attempt to plot the wave cloud relative to ground was made. Its results are presented. A study of an ordnance map of the area show three main ranges to lie upwind of the wave cloud. These ranges are described in the pap From the values of the wave length obtained it appears that the nearer range of hills w responsible for the wave clouds. *Subject Headings:* **1. Lenticular clouds 2. Wave clou 3. North Brecknockshire, Wales.**—*I.S.*

11.6–330 551.576.11:778.4:681.14:621

Schulz, H., **Zur Auswertung von Wolkenmessbildern mit elektronischen Rechenau maten.** [Evaluation of cloud photographs with electronic computers.] *Beiträge zur Phy der Atmosphäre*, Frankfurt a. M., 32(1/2):78–83, **1959.** 5 refs., eqs. German, English a French summaries p. 78. **DWB, DLC**—Stereoscopic methods of evaluating cloud pho graphs and use of an electronic computer in reduction and analysis of the data are described detail on the basis of techniques used at the Institut für Meteorologie at Darmstadt. *Sub Headings:* **1. Cloud photogrammetry techniques 2. Electronic computing of cloud photogra metry data. 3. Stereocomparator cloud photograph measurements.**—*From author's abstr*

11.6–331 551.576.4:551.576.3(234

Bouët, Max (*Montana-Vermala, Suisse*), **Les cumulus dans les Alpes Valaisannes.** [mulus clouds in the Valais Alps.] *Archiv für Meteorologie, Geophysik und Bioklimatolo Ser B.*, Vienna, 9(3/4):323–326, **1959.** 2 tables, 3 refs. French, German and English su maries p. 323. **DWB, DLC**—In the Alps of the Valais (Switzerland) the base of the hei of the fine weather cumuli and of the cumulo-nimbi of local character is situated between 1 and 4500 m above sea level; the average height is 3160 m. The diurnal and the annual va tion of the condensation height and the frequency distribution are discussed. *Subject He ings:* **1. Cumulus cloud data 2. Cloud height data 3. Valais Alps, Switzerland.**—*Auth summary.*

PRECIPITATION

See also: **Precip. distribution, Vienna** (Steinhauser et al.), 11.6–6; **Rainfall effects on farming, Rio Grande Plain** (Waldrip), 11.6–55; **Precip. interception by forests** (Noirfalise), 11.6–57; **Precip. effects on forest fires** (Bruneton), 11.6–60; **Storm rainfall studies** (Wiese), 11.6–200; **Rainfall-percolation relationship** (Lawes), 11.6–202; **Precip. data, Netherlands,** 11.6–221; **Precip. scavenging of aerosols** (Hess), 11.6–262; **Rainfall intensities** (Sabourеau), 11.6–280.

11.6–332 551.577.21:551.577.36(4

*Netherlands. Meteorologisch Instituut, **Frequencies van k-daagse neerslagsom op Nederlandse stations** [Frequencies of rainfall amounts of k-days on Netherlands statio Vol. 18, pub. **1959.** 267 p. ([Publication] No. 140). Almost entirely tables. Pr f 10.00. **DWB**—The Meteorological Institute of the Netherlands has published its 18th of a new series of publications relating to stations which present a long series of observat

inimum 50 yrs). This publication deals with the frequency distribution of the total rain-l amounts in periods of k consecutive days; $k=1$, 2, 3, 5, 7, 10, 15, 30, 60, 90, 180, 360, 540, 0, 1080, 1800. One describes the material from which the k-day period rainfall amounts re constructed (wholly automatically with the help of the punched cards of the daily amounts). ne tables relating to the frequency distribution contain 8 columns, each of which is explained. umerical examples show clearly the practical use of the frequency distribution tables. *Sub-t Headings:* **1. Rainfall amount 2. Rainfall frequency distribution 3. Netherlands.**—*A. V.*

11.6–333 551.577:519.24 551.577.32/37(410)

Archer, M. Scott., **A rainfall analysis for the area of the lower Dee from July to Sept, 1957.** *eather*, London, 14(2):57–64, Feb. **1959.** 11 figs., 4 tables, 3 refs. **DWB**—Synoptic and pecially frontal conditions over S.W. England which gave rise to a record continuous rain d floods from Sept. 23 to 25th, 1957 are analyzed and isohyetal charts presented for the Lower ee to show 24-hour and total rainfall on Sept. 23, 24, 25; on 23–25; and for July–Sept. (both amount and % of normal for 1881–1915), with a statistical evaluation showing probability recurrence once in 1000 yrs. In fact, for the 3 yrs 1956, 1957 and 1958 there is a probability such a series of events occurring only once in 2000 yrs, as all 3 summers were well above rmal. This may indicate a trend toward wet summers. *Subject Headings:* **1. Record wet mmers, S.W. England (1956, 1957 and 1958) 2. Floods, Lower Dee, Eng., (1957) 3. Dee lley, Eng.**—*M.R.*

11.6–334 551.577.36:551.501.45(773)

Huff, F. A. and Neill, J. C. (*both, Illinois State Water Survey*), **Comparison of several ethods for rainfall frequency analysis.** *Journal of Geophysical Research*, Wash., D. C., (5):541–547, May **1959.** 2 figs., 6 tables, 12 refs. **DLC**—Five frequency distributions were mpared for their ability to fit maximum rainfall values in Illinois. Analyses were performed both seasonal and annual maxima for storm periods of one to ten days. Calendar-day infall amounts from 39 stations for the 40-yr period, 1916–1955, provided the basic data for e study. Initially, an evaluation was made of frequency relations based upon individual ation data. This evaluation indicated that more reliable results would be obtained by deter-ning average relations based upon data from several stations within an area. Consequently, e state was divided into four sections having approximate storm rainfall homogeneity. ext, average frequency relations based upon each of the five frequency distributions were termined for each section and storm period. Statistical tests indicated no marked superi-ity for any one of the distributions. Comparisons were made between results obtained from e methods of moments and least squares in data fitting. It was concluded that differences tained between the two methods are insignificant. *Subject Headings:* **1. Rainfall frequency stribution analysis 2. Maximum rainfall 3. Illinois**—*Author's abstract.*

11.6–335 551.577.37:551.578.7(477.31)

Kiritsa, E. I., **Sil'nyĭ liven' i grad v Tiraspol'skom raĭone Moldavskoĭ SSR.** [Heavy wnpour and hail in the Tiraspol' region of the Moldavian Republic.] *Meteorologiia i drologiia*, Leningrad, No. 2:44, Feb. **1959. DWB, DLC**—On July 4, 1958 a heavy down-ur with hail and strong wind was observed in Slobodzeia. The downpour and hail lasted a lf hour. There fell 53.44 mm of rain. The hail fell in amorphous pieces, the size of walnuts d weighing 28.33 gms. The individual hailstones consisted of 3–5 small spherical hailstones uich had coalesced. *Subject Headings:* **1. Rainfall extremes 2. Hailstorms 3. Tiraspol' gion, Moldavian S.S.R.**—*I.L.D.*

11.6–336 551.577.38:551.586:591.9:539.325

Bronson, Franklin H. and Tiemeier, Otto W., **The relationship of precipitation and black-led jack rabbit populations in Kansas.** *Ecology*, Durham, N. D., 40(2):194–198, April **1959.** igs., table, 9 refs. **DWB, DLC**—Data are presented on the changes in numbers of black-led jack rabbits on a study area in relation to the termination of a 5-yr drought. The data re collected during the period July, 1956 to Nov. 1957 in the Arkansas River valley and the id-hills of east-central Kearny County, Kan. An inverse relationship between the monthly ecipitation and the abundance of jack rabbits was indicated for the study area located in

the edge of the sand-hill region. When drought and over-grazing depleted the food supp in the hills, the jack rabbits migrated to the edge of the hills in search of food. When t drought ended and food was again available, the jack rabbits dispersed throughout their norm range. Field observations indicated that north of the Arkansas River valley, jack rabbi concentrated because of a lack of suitable daytime resting habitat. Recorded jack rabb population fluctuations in Kansas are apparently as much a function of these concentrati and dispersion movements as they are of actual increases or decreases in population size. is theorized that, early in the 1952–56 period, drought and overgrazing were factors whi increased the carrying capacity of certain areas for jack rabbits and the population increase As the drought intensified the denuded areas could no longer support the larger populati and the animals concentrated because of a lack of food and/or daytime resting areas. It suggested that concentration and dispersion movements similar to those found in this stu could be interpreted as actual changes in over-all population size in other situations, partic larly where only censusing data from limited localities are available. *Subject Headings:* **Drought effects on animal distribution 2. Rabbits 3. Kansas, U. S. A.**—*Authors' summa*

11.6–337 551.577.38:551.585.55:631.58(4

Davitaia, F. F., **Nauchnye osnovy bor'by s zasukhoĭ po prirodnym zonam SSSR.** [Scie tific bases of drought prevention by natural zones of the U.S.S.R.] *Akademiia Nauk SSS Izvestiia, Ser. Geografich.*, No. 1:7–29, Jan./Feb. **1959.** 8 figs., 2 tables, 8 refs. **DWB**—T general meteorological conditions associated with drought in steppe and forest steppe regio and arid regions, the climatic factors in arid regions favoring high agricultural productivit and the profitability of irrigation as a function of expense of irrigation are discussed and comprehensive account is given of various scientific agricultural techniques for preventi drought. The methods and conditions of utilization of clean fallow fields, forest shelter bel snow accumulation, retention of melt waters, irrigation, variation in the dates and standar of sowing by taking into account current and predicted weather conditions, and different methods of soil cultivation are described in detail for various regions of the U.S.S.R. Ma showing differences in productive moisture supplies in the meter soil layer on clean fallows the time of winter sowing and under spring crops during harvesting, mean long period satu tion deficit in the meter layer at the beginning of early spring sowing, annual variation of so precipitation increase of snow cover by ten-day periods, per cent of area occupied by ravi and gullies in the Don River basin, spring surface run off and differences between evaporati and potential evaporation in mm/year are presented. *Subject Headings:* **1. Drought preve tion 2. Arid zone agriculture 3. U.S.S.R.**—*I.L.D.*

RAIN, SNOW AND HAIL

See also: **Snow trafficability** (Buvert et al.), 11.6–65; **Snow melt effects on floods** (Pardé), 11.6–195; **Snowfall measurement techniques** (Krasovskiĭ), 11.6–217; **Cloud water content measurement** (Simidchiev), 11.6–229; **Raindrop size distribution** (Mészáros), 11.6–233; **Blizzards** (Brunk), 11.6–308; **Hailstorms** (Kiritsa), 11.6–335.

11.338 551.574.1:551.578

Jones, Douglas M. A. (*Ill. State Water Survey*), **The shape of raindrops.** *Journal Meteorology*, Boston, 16(5):504–510, Oct. **1959.** 10 figs., (incl. photo), 2 tables, 10 refs., 3 e **DWB, DLC**—An investigation of the physical shape of raindrops, using two cameras at ri angles is described, and the results are tabulated and graphed. The data included measu ments of 1783 raindrops of which 569 were classified as spherical, 496 as oblate, 331 as prol and 387 unclassified. The sizes measured ranged up to 6.4 mm equivalent spherical diame It is concluded that there is a mean shape which varies uniformly with the mass of raindrop, but that this shape is the result of oscillation about the mean. *Subject Heading* **Raindrop shape investigation.**—*Author's abstract.*

11.6–339 551.577.13:551.578

Oddie, B. C. V. (*Met. Office, London*), **The composition of precipitation at Lerwick, Sh land.** *Royal Meteorological Society, Quarterly Journal*, 85(364):163–165, April **1959.**

ables, 3 refs. **DWB, DLC**—It is shown that most of the salts deposited at Lerwick arrive sea-spray rather than in true precipitation. Mg, K and Na are present in very nearly the ne proportions as in sea water: but there is a very great deficiency of chlorine, which, it is ued, can only be explained on Cauer's hypothesis that NaCl in aerosol form is dissociated d that Cl or HCl is released. *Subject Headings:* **1. Precipitation composition 2. Salt spray Lerwick, Shetland Is.**—*Author's abstract*

11.6–340 551.578.4:536.422:542.496

Muguruma, J. and Higuchi, K. (*both, Hokkaido Univ.*), **On the etch pits of snow crystals.** *eteorological Society of Japan, Tokyo, Journal*, Ser. 2, 37(2):71–75, April **1959.** 2 figs., 6 ptos, 8 refs. Japanese summary p. 75. **DWB, DLC**—Microscopic observation was carried t for the sublimation process of snow crystals covered with plastic replica film. It was nfirmed that the thermal etch pits were formed on the surface of snow crystals during this ocess together with the sublimation from the rim of the crystals. The shape of the etch s is reasonable in view of the crystal axis. The chemical etching of snow crystals was ob- ved by keeping them in kerosene for three months. Observation of the thermal and chem- l etching shows that the plane snow crystal developed from one center nucleus is a single ystal. *Subject Heading:* **1. Snow crystal sublimation.**—*Authors' abstract.*

11.6–341 551.578.43(747)

Oswego snowburst. *Weatherwise*, Boston, 12(2):51, April **1959.** table. **DWB**—A al of 40 in. of snow fell at Oswego State Teachers College, N. Y., on Dec. 7–8, 1958 (and 86 fell in Dec.), breaking both greatest monthly and 24-hour amounts since records began in 85. At Bennets Bridge, 30 mi east of Oswego, 51 in. fell in 16 hrs on Jan. 17, 1959. This 0 ft hill exposure is considered the snowiest Weather Bureau Station in the eastern U. S. ily amounts and accumulations for Oswego from Nov.–April are given in a table. All d 170 in. fell in 1958–59 winter. *Subject Headings:* **1. Record snowfall, Oswego, N. Y. ec. 7-8, 1958) 2. Snowfall extremes 3. Oswego, N. Y.**—*M.R.*

11.6–342 551.578.46(234.42)

Konček, Mikuláš, **Schneeverhältnisse der Hohen Tatra.** [Snow conditions in the gh Tatras.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):132–133, **1959.** German, nglish and French summaries p. 132. **DWB, DLC**—According to the results of mostly 30 ars' duration in the observations of 14 meteorological stations, there is given here a detailed alysis of the snow-conditions in the region of the High Tatras. On the southern and south- stern slopes of the mountain chain the number of days with snow-cover increases with the ight, in accordance with the empirical formula of Conrad. On the windward side of the rthern slopes, better results are given by Chomicz's formula ascertained on the Polish side the Carpathians. The differences in the snow-conditions on the southern and northern opes of the chain are essential. At a height of about 1000 m above sea level the snow-cover sts 16 days longer on the northern than on the southern slopes. There is in Feb. an average 48 cm of snow-cover in the north and 34 cm in the south. The thickness of snow-cover of cm and more lasts 90 days in the north and 61 days in the south. Snow may occasionally ll from 1000 m above in any season of the year and from 1300 m above there may be a snow- ver in the warmest summer months, though only temporarily. Up to a height of 1300 m e snow cover is highest on an average in Feb., and in the higher regions in March. *Subject eadings:* **1. Snow cover data 2. Tatra Mountains, Czechoslovakia.**—*Author's abstract.*

HYDROMETEOROLOGY

See also: **Hydromet. services, Byelorussian S.S.R.** (Glomozda), 11.6–27; **Sec. F2,** p. 872; **Floods** (Saboureau), 11.6–280; **Runoff effects on erosion** (Corbel), 11.6–310.

11.6–343 551.578:551.588.6(73)

Frank, Bernard (*Division of Watershed Management Research, U. S. Forest Service*), **Some pects of watershed management research in the United States.** *Switzerland. Anstalt für s Forstliche Versuchswesen, Mitteilungen*, 35(1):9–20, **1959.** German, French and Italian

summaries p. 19–20. Author draws attention to the necessity of studying all the fact having an effect on the water balance within a drainage basin. He examines the relationsh existing between soil, vegetation and water circulation when applying various treatme (intensity of exploitations, conveyance methods, etc.). These researches take increasi importance, on the one hand on account of the numerous services awaited from the fore and on the other hand on account of the difficulties inherent in former errors in which can g erally be found the cause of unusual floods and inundations. One shall take particular inter in investigations conducive to specifying how the yield obtained from the watershed mana ment can be increased. *Subject Headings:* **1. Sylviculture 2. Water balance 3. Soil-vege tion-water balance relationships.**—*A. V.*

11.6–344 551.579:551.573:551.437:627.81:628

van Himbeeck, Cl., **Beschouwingen over de watercyclus in natuurlijke en kunstmat hydrographische bekkens als basisstudie voor kultuurtechnische en civieltechnische werk** [Considerations on the water cycle in natural and artificial watersheds as a basic study agricultural and civil engineering.] *Agricultura*, Louvain, Belgium, Ser. 2, 7(3):405–4 Sept. **1959.** 9 figs., 3 tables, 14 eqs. French summary p. 445–446. **DA**—A general study presented of the various factors of the water cycle, such as precipitation, evaporation, cond sation, infiltration, soil water storage and especially the runoff to a river. The knowledge appearance and extent of each of these factors, especially of the last, is important for each stu in agricultural and civil engineering. This article intends to give some explanation of the fo of a watershed, evaporation and water movements in the saturated phreatic zone and the n saturated zones. In this way it tries to find an easier calculation method for the correlati between the elements of the water balance, applied on a natural part of a watershed. *Subj Headings:* **1. Hydrologic cycle 2. Water balance 3. Watersheds.**—*A. V.*

11.6–345 551.579.4(8

Byers, Horace R. (*Dept. of Met., Chic. Univ.*), **Methods of estimating the maximum flo 1959?** 12 p. table, 8 refs., eqs. Reproduction of typescript. **DWB** (M79.4 B993me) After a brief review of the criteria, an account of the "maximum design flood" methodol as applied to the Boconó Basin in Venezuela is given, involving the use of a synthetic storm a RIEHL'S scheme for determining the limiting factor by which the intensity of a storm could greater than the average. The other method described deals with rain estimates from ext tropical storms. The successful results obtained in forecasting precipitation over large ar by these methods are mentioned briefly. *Subject Headings:* **1. Maximum floods 2. Flo models 3. Boconó Basin, Venezuela.**—*W. N.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATIC ZONES

See: **Latitude effects on cosmic rays** (Brown), 11.6–113.

CLIMATE OF PARTICULAR PLACES

See also: **Climate, Vienna** (Steinhauser et al.), 11.6–6; **Climate, China** (Wang), 11.6–16; **Climate, N. Canada** (Longley), 11.6–48; **Climate, New Amsterdam Is.** (Aubert), 11.6–218; **Climat. data summaries, Uccle** (Sneyers), 11.6–222; **Climat. data, Netherlands** (Ten Kate), 11.6–223; **April weather, U. S.** (Andrews), 11.6–243; **Wind mapping, U. S.** (Brekke), 11.6–311; **Climate atlas of world** (Lieth), 11.6–358; **Climate, Lvov** (Gitis), 11.6–363; **Climate, Tristan da Cunha** (Van Loon), 11.6–366.

11.6–346 551.582(520):621.311

Arakawa, Hidetoshi (*Met. Res. Inst., Tokyo*), **Hydroelectric power generation and climate of Japan: a case of engineering meteorology.** *American Meteorological Soci Bulletin*, 40(8):416–421, Aug. **1959.** 4 figs., 2 tables, 4 refs. **DWB, DLC**—The climate pl an essential role in hydroelectric power generation of Japan. An effort is made to clarify

sic seasonal variations of hydroelectric generation from the climatological point of view. om the viewpoint of a statistical probability, extra stand-by steam-generated power necessary drought is computed for each Japanese electric power and utility company. *Subject eadings:* **1. Climate of Japan 2. Hydroelectrical engineering 3. Japan.**—*Author's abstract.*

11.6–347 551.582(57) 551.584.61

Brill', T. M., **Klimaticheskaia sreda Sibiri i mikroklimat neotaplivaemykh pomeshchenii nikh pionerskikh lagerei.** [The climate of Siberia and the microclimate in the unheated ildings of summer scout camps.] *Gigiena i Sanitariia*, Moscow, 24(8):37–42, Aug. 1959. igs., table, 6 refs. English summary p. 42. **DLC**—The peculiarities of the Siberian climate reate special conditions for the use of unheated summer buildings at the scout camps. The de daily range of temperature fluctuations (8–10) with cold spells in summer and low mean mmer temperature require special planning and construction of scout camp buildings. The easurements of microclimatic indices in the dormitory blocks of scout camps with different anning arrangements and outside walls made of various materials indicate the best solution r maintaining a stable microclimate in spite of sharp weather changes. It is important that the dormitory blocks the doors from the dormitories should open either into a corridor or to glass verandah. The walls should be sufficiently heat resistant (4.0–4.5 cm thick), thin anks being quite satisfactory for the purpose. *Subject Headings:* **1. Climate of Siberia Indoor climates 3. Siberia.**—*Author's abstract.*

11.6–348 551.582(456.3)

Riccardi, Mario, **Il Bacino di Fondi.** [The basin of Fondi.] *Societá Geografica aliana, Bollettino*, Ser. 8, 12(1/3):27–99, Jan./Mar. **1959.** 13 figs., 113 foot-refs., 7 tables, photos. English summary p. 99. **DWB, DLC**—In a long article about the geography nd population of the basin of Fondi, mean lat. 41°20′, long. 13°20′E, on the Tyrrhenian coast of Rome in northern Italy, the climate, hydrology, human settlement (27000 inhabit- nts), economic basis (mainly citrus fruit), forestry, fishing, tourism, etc., the climatic condi- ons are extensively treated. Records at Fondi and Terracina, and to a lesser extent at Monte Biagio and Sperlonga are analyzed to show seasonal variations in temperature and precipita- on elements (maximum and minimum, intensity and density of precipitation, etc.), and the onsequences for runoff, irrigation, agriculture, etc. *Subject Headings:* **1. Climate of Fondi asin, Italy 2. Fondi Basin, Italy.**—*M.R.*

11.6–349 551.582.2:551.588.2(811)

*Kühlhorn, Friedrich (*Munchen*), **Forschungen im südlichen Mato Grosso, I, Ober- ächengestalt, landschaftliche Gliederung und Klima.** [Investigations in southern Mato rosso, Pt. 1, Surface configuration, landscape classification, and climate.] *Petermanns eographische Mitteilungen*, Gotha, 103(2):81–99, **1959.** 9 figs., 4 tables, 7 refs. **DWB, DLC**— his is the first of three papers to be published. The present paper is a descriptive account topography and climatology of the landscape in the region of the Rio Ivinheima between t. 22°15′S, long. 53°42′W and lat. 22°41′S, long. 53°37′W as experienced during the German South American Expedition 1937/38." The author was a member in the capacity of a zoolo- ist. The description includes authentic recordings of runoff data, in monthly means and verage, and for the temperature in graphs for monthly variation and in two tables in monthly ean and in number of days of highest and lowest readings in each month of the year 1937. *ubject Headings:* **1. Climate of Mato Grosso 2. Topoclimatology 3. Mato Grosso, Brazil.**— *V.N.*

CLIMATE CHANGES

See also: **Co_2 cycles and climatic changes,** 11.6–250; **Circulation types** (Barry), 11.6–364.

11.6–350 551.583(436.2)

†Wacha, Georg (*Linz*), **Zur Wetterchronik des Linzer Raumes.** [Weather chronicle f the Linz region.] *Wetter und Leben*, Vienna, Sonderheft, No. 6:5–46, **1959.** tables, 171 efs. **DLC**—The weather chronology is based upon records of various cosmic, telluric, weather,

hydrological, plant and animal phenomena in this region recorded in various documents a compiled by various individuals. The contents of this paper are as follows: weather phenom going back as far as 7-8 B.C. to 482 A.D.; early and high middle ages; late middle ages; weat observations of the humanists; weather observations during the 16 and 17th centuries; weather observations of the first half of the 18th century; and the instrumental observati of the middle of the 18th century. *Subject Headings:* **1. Historic weather records 2. Clim of Linz 3. Linz, Austria.**—*I.L.D.*

11.6–351 551.1(438.4) 551.583.3(438

†Jahn, Alfred, **Wyzyna Lubelska; rzeźba i czwartorzed.** [Geomorphology and Quatern history of Lublin Plateau.] *Polska Akademia Nauk. Instytut Geografii, Prace Geograficz* No. 7, **1956.** 453 p. 103 figs., 5 maps (fold.), 3 tables, 195 refs. Russian and English su maries p. 420–453.—This extensive monograph, and its numerous diagrams and photograp are a product of the author's systematic field work in 1945–1954. In addition to givin region-by-region analysis of the area's geological history, it contains information of paleoclir tological interest. Evidence is found of semi-arid steppe climate during the decline of Sarmatic and the Upper Pliocene periods, separated by a period of warm humid climate dur the Lower Pliocene. The Pleistocene is found to have begun with a series of increasing osci tions in climate rather than with a sudden change. The Plateau had been a periglacial z at least once, before the total glaciation occurred. During the glacial periods the aver temperature of the area was 8–9°C lower than at present and the difference between gla and interglacial temperatures appears to have been at least as great as between the pres forest zone and sub-Arctic tundra. Precipitation differences between glacial and intergla periods are believed to have been smaller than temperature differences. *Subject Headir* **1. Geomorphology 2. Quaternary climates 3. Lublin Plateau, Poland.**—*G.T.*

11.6–352 551.583.3:551.324.63(

Mellor, Malcolm, **Variations of the ice margins in East Antarctica.** *Geographical Jour* 125(2):230–235, June **1959.** 2 figs., 18 refs. **DLC**—The author investigated the probl whether or not there had been fluctuations of the ice margins during the past century and find evidence of changes for post-Pleistocene variations. An examination of the coastal cliffs of the coast of Mac-Robertson Land on the basis of the 1936 mapping by the Lars Christ sen Expedition and aerial photographs showed that no drastic changes had taken place betw 1936 and 1957. In Dec. 1957 the ice cliffs of the Dovers Glacier were 3½ km in advance of th 1936 position. The tongue of the Hosearon Glacier terminated in Aug. 1957 1¼ km fart back than the 1936 position. The Tayler Glacier was in 1956 a few hundred meters m advanced than in 1936. No change in the areal extent or thickness of the ice on Fold Isl was observed, etc. The botanical evidence suggests that the volume of ice may have b constant for a longer period. The evidence for glacial retreat at Heard Island is cited; is attributed to climatic amelioration resulting from the increased frequency of southwest winds during the past 100 yrs. This has led to a decrease in the volume of ice on Heard Isl without any corresponding changes in the rest of Antarctica. Finally, a major glacial recess appears to have been initiated in Antarctica not less than 10,000 yrs. ago. The estima seem to indicate that the glacial decline from the Pleistocene maximum and the onset of climatic optimum in Antarctic occurred contemporaneously with these events in other pa of the world. *Subject Headings:* **1. Climatic changes, East Antarctica 2. Glacier movem 3. Mac-Robertson Coast, Antarctica.**—*I.L.D.*

11.6–353 551.583.3:551.241:56

Piérart, P., **Contribution à l'étude des spores et pollens de la flore à Glossopteris conte dans les charbons de la Luena (Katanga).** [Contribution to the study of spores and pollen Glossopteris flora contained in the coal of Luena (Katanga).] *Académie Royale des Scie Coloniales, Brussels. Classe des Sciences Naturelles et Médicales, Mémoires in 8°, N. S.,* 8 **1959.** 80 p., 3 figs, 10 prints, 3 tables, 28 refs. **DWB, DLC**—Maceration of carbonac samples taken in the three strata of the Luena coal fields has shown the existence of nume dispersed fossil spores. These are, for the most part, identical with those dispersed in

mian coals of India, Brazil and Australia. Miospores reported are the same as those cribed for India and Australia. They exist also in the Brazilian coals. As to megaspores, y are utterly similar to those reported for Brazil. This extraordinary resemblance between Permian fossil megaspores of Brazil and Katanga might be put forward in favor of the othesis on the drift of continents. *Subject Headings:* **1. Glossopteris flora in coal 2. ores and pollens 3. Continental drift 4. Katanga, Belgian Congo.**—*Transl. of author's stract.*

MICROCLIMATOLOGY

See also: **Forest microclimat.** (Pavari), 11.6–58; **Topographic effects on soil moisture** (Krumbach), 11.6–201; **Indoor climates** (Brill'), 11.6–347.

11.6–354 551.584.3:551.588.6:634.0.1

*†Hartmann, Friedrich Karl; van Eimern, Josef and Jahn, Gisela, **Untersuchungen reliefdingter kleinklimatischer Fragen in Geländequerschnitten der hochmontanen und montanen ufe des Mittel- und Südwestharzes.** [Investigation of microclimatic problems connected h topography at the high-mountain and mountain levels of the central and southstern Harz Mountains.] *Germany. Deutscher Wetterdienst, Berichte,* 7(50), **1959.** p. 35 figs., 17 tables, 26 refs. German and English summaries p. 3. **DWB, DLC**—The dy deals with microclimatic measurements carried out in the "montane" and "hochmontane ufe" of the Harz Mts. at differently exposed slopes, in valleys, on summits and ridges, parularly in forest cultivations. The measurements covering air and soil temperature, air midity and soil moisture, radiation, brightness and evaporation, have been made in Sept. 53 and June 1954, i.e., in two seasons with different positions of the sun. The meteorological asurements led to a microclimatic classification of the forestry locations which have been mpleted by a macroclimatic comparison with other German uplands. Besides the meteological measurements the composition of forest trees and plants, the resulting phytosocigical communities and the soil conditions were analyzed. The present forestry climatolog- l investigation offers a series of microclimatological and forestry meteorological results and veals, above all, connections between plant sociological groups (Pflanzengeselleschaften), l conditions and climate. *Subject Headings:* **1. Microclimatological data analysis 2. Forest croclimatology 3. Mountain climates 4. Harz Mountains, Germany.**—*Authors' abstract.*

11.6–355 551.584.33(675)

Moureau, J. **Observations microclimatiques en 1956 au bord du Lac Tumba.** [Microimatic observations in 1956 on the shore of Tumba Lake.] *Société Royale des Sciences de ége, Bulletin,* 28(1/2):29–46, Jan./Feb. **1959.** 4 figs., 8 tables, 5 refs. **DWB, DLC**—bservations spread over a one year period make it possible to define the microclimatical feares of various plant types covering the shores of Tumba Lake. The "ésobé" microclimates e rather clearly differentiated from the forest biotopes. With regard to forest microclimates, ey present various important features: 1) Very high diurnal temperatures of air and ground; Distinctly low nocturnal temperatures; 3) Considerable range between diurnal and nocrnal temperatures of air and ground; 4) Important diurnal saturation deficiency and sharply arked range between diurnal and nocturnal deficiencies; 5) Less rainfall than in the forests. *ubject Headings:* **1. Microclimates 2. Tumba Lake, Belgian Congo.**—*A.V.*

11.6–356 551.584.5:551.588.2:777.4

Landsberg, Helmut, **The weather in the streets.** 3 page reprint from *Landscape,* Vol. 9, o. 1, Autumn **1959. DWB** (M:72 L294we)—General remarks on the value of knowledge microclimate in the planning of cities and design of houses or housing developments. Exnples are cited of harm caused by ignorance of these factors which were known to the ancients, ch as the effects of valleys on temperature, wind, smog, moisture in soil and air, and of vegetaon on solar radiation, wind, dust, temperature, etc. Macroclimate as well as microclimate is portant. *Subject Headings:* **1. Climate and town planning 2. Microclimatic effects on abitation 3. Topoclimatology**—*M.R.*

11.6–357 551.584:

Gressel, Walter, **Zur Bewetterung alpiner Höhlen.** [Weather in Alpine caves.] *G many. Deutscher Wetterdienst, Berichte*, 8(54):216–217, 1959. German, English and Frer summaries p. 216. **DWB, DLC**—The fundamental problems of speleometeorology, rev a new phase of meteorological exploration. The results show the correlation between t circulation in alpine caves, the direction and intensity to the situation in the free atmosphe The examination is interpreted from numerous observations and a classification from t alpine cave was given. The observation was made in variable alpine caves and especia in the cave of ice, the Eisriesenwelt, near Salzburg, the greatest cave of ice of the world. T circulation is very important for the ice formation in the cave. *Subject Headings:* **1. Ca microclimatology 2. Ice caves 3. Eisriesenwelt cave, Austria.**—*Author's abstract.*

CLIMATIC CLASSIFICATION

See also: **Drought prevention by natural zones** (Davitaia), 11.6–337.

11.6–358 551.585:63:551.501.5:551.58

Lieth, Helmut (*Botanisches Institut der Landwirtschaftlichen Hochschule Stuttgart-Hoh heim*), **Ein Klimadiagram-Weltatlas als Unterlage für vegetationskundliche und landbauw senschaftliche Arbeiten.** [A world atlas on climatic diagrams intended as a basis for stud on vegetation and agriculture.] (In: Food and Agriculture Organization of the United N tions, **World Congress on Experimental Agriculture, Rome, May 7–9, 1959,** issued 19 p. 1423–1429. 2 figs. German, French, English and Spanish and Italian summaries.) **DLC** At the Botanical Institute of the High School of Agriculture in Stuttgart Hohenheim, a wo atlas on climatic diagrams, intended as a basis to establish climatic parallels relating to ext sive study areas on vegetation and agriculture, is being prepared. The atlas has a diagr of all climatic stations where data can be obtained. The diagrams clearly show the most i portant ecological data. The many diagrams of a geographical zone are given in synthe form in the climatic cartograms, and in this way, regions, climatically homogeneous, established. All the diagrams of a given area offer, within certain limits, similarities. order to achieve a systematic cartography of the whole world, based on comparability crite ten climatic types are established, marked with Roman numerals, within which other s divisions are established. In fig. 2, a secondary chart, taken from the atlas in preparati is shown as an example of climatic cartograms. The main charts are printed in several colo Each chart carries the corresponding climatic diagrams—classified by types—in special supp ments which can be taken out of the atlas for special studies and, in some cases, can be p chased separately as work sheets. *Subject Headings:* **1. Climatic classification 2. Clima diagrams 3. Agricultural climatic classification 4. Climatic atlases.**—*Author's abstract.*

11.6–359 551.585.7:551.589(234

Gressel, Walter, **Zur Klassifikation der Wetterentwicklung im Alpenraum von 1946 1957.** [Classification of the weather development in the Alpine regions from 1946 to 195 *Germany. Deutscher Wetterdienst, Berichte*, 8(54):212–215, 1959. 2 tables. Germ French and English summaries p. 212. **DWB, DLC**—Independent from the statist relating to alpine weathertypes, the development of alpine weather was obtained from a wh different point of view, dynamic and genetic, and placed for the time 1946–1957. With types, the classification is limited to a reasonable measure and makes possible a determinat of the weather development. The classification in the period was obtained from day to d from a dynamic and genetic viewpoint. The result shows the weather development from mo to month and corresponds exactly to that expected and experienced. It offers a swift and e method to characterize the development of very difficult weather alpine types. *Subject He ings:* **1. Alpine climates 2. Weather type classification.**—*Author's abstract.*

BIOCLIMATOLOGY

See also: **Bioclimat. bibliogs.**, 11.6–45; **Forage-crop production** (Hedin, Kerguelen), 11.6–51; **Agromet.** (Molina Abela), 11.6–52; **Plant bioclimat.** (Pichotka), 11.6–53; **Frost damage to plants** (Vaupel), 11.6–54; **Plant disease—weather relationships** (Van Arsdel), 11.6–59; **Fire danger rating** (Vowinckel), 11.6–61; **Water vapor absorption by human skin** (Buettner), 11.6–63; **Ecoclimat. networks** (Dupriez), 11.6–219; **Climat. effects on plants** (Band), 11.6–224; **Drought effects on animal distribution** (Bronson, Tiemeier), 11.6–336.

11.6–360 551.586:612.014.4

Thom, Earl C. (*Office of Clim., U. S. W. B., Wash., D. C.*), **The discomfort index.** *Weatherwise*, Boston, 12(2):57–60, April **1959.** 4 figs., table, ref. **DWB**—Earl Thom, the proponent the widely publicized "Discomfort Index," explains its derivation and uses. The formula: $I = 0.4(td+tw)+15$, is empirical; td is dry bulb temperature in °F; tw is wet bulb temperature (°F) and readings must be simultaneous. Discomfort is felt at indexes above 70. Over 1f are uncomfortable if DI > 75 and everyone if DI = 79. Government regulations permit ss dismissals if DI ≥ 86. Highest values in July 1956 were 89 at Yuma, Arizona and Dallas, xas; 86 at Phoenix and Evansville; 85 at Sacramento, and 84 at Las Vegas, Nevada. DI lues with 60 as a base are used for cooling degree day calculations (as shown in table); on s basis Seattle had 297 compared with Miami—446 degree days in 1956. *Subject Headings:* **Discomfort index 2. Cooling degree-day data, U.S. 3. United States.**—*M. R.*

11.6–361 551.586:612.792

Bass, David E.; Mager, Milton and Barrueto, Richard B., **The effect of a vapor barrier rates of excretion of sweat solutes.** *U. S. Quartermaster Research and Engineering Center, nvironmental Protection Research Div., Technical Report* EP-103, March **1959.** 9 p. 3 tables, refs. **DWB** (M86 U587t)—The effects of a vapor impermeable barrier on rates of excretion Na, Cl, K, true creatinine, and "apparent" creatinine from the arms of men during thermal eating were determined by collecting sweat solutes simultaneously from both arms, one of hich was enclosed in a polyethylene bag. The separate effects on rates of excretion of the gher local skin temperature (T_s) and higher relative humidity (RH) imposed by a vapor rrier were assessed by means of a thermoregulated arm-chamber. Wearing a vapor barrier sulted in a significantly decreased rate of excretion of K and an increased rate for both true d "apparent" creatinine. The effect on "apparent" creatinine was attributable entirely the increased excretion of the fraction represented by true creatinine. Rates of excretion of a and Cl were not significantly affected by a vapor barrier. Increased T_s *per se* resulted in gher excretion rates of Na, Cl, K, true creatinine, and urea. Increased RH *per se* led to creased excretion of Na, Cl, K, and urea, but had no effect on rate of excretion of true creatine. The observed effect of a vapor barrier on excretion rates of these sweat solutes was herefore the net result of T_s and RH operating in opposite directions; thus, RH was more fective relative to K, and T_s was more effective relative to true creatinine. These factors erted approximately equal and opposite effects on both Na and Cl. *Subject Headings:* **Sweating 2. Vapor effects on sweating.**—*Authors' abstract.*

ENVIRONMENTAL INFLUENCES

See also: **Grasslands climat.** (Mather), 11.6–28; **Temp. changes in cypress logs** (Curry, Griffiths), 11.6–56; **Forest micromet.** (Noirfalise), 11.6–57; **Forest influences on climate** (Pavari), 11.6–58; **Soil-vegetation-water balance relationships** (Frank), 11.6–343; **Topoclimat.** (Kühlhorn), 11.6–349; **Forest microclimat.** (Hartmann et al.), 11.6–354.

11.6–362 551.588.6:634.9 551.311.31

Maheut, J. and Dommergues, Y. **La fixation par le reboisement des dunes de la presqu'île Cap-Vert et l'évolution biologique des sols.** [Stabilization of the Cape Verde peninsula nd hills by afforestation and biological evolution of soils.] *Bois et Forêts des Tropiques*, Paris, :3–16, Jan./Feb. **1959.** 4 figs., 7 tables, 6 refs. English and Spanish summaries. **DLC**—

After revieweing the climatic, edaphic and phyto-sociological characteristics of the Cape Ver peninsula, the authors explain the method of stabilizing drifting coastal dunes based on t exclusive use of the Filao (*casuarina equisetifolia*). Pt. 2 of the paper is devoted to the bi logical evolution of sand-hill soils after afforestation. Because it causes a spectacular rise the level of biological activity, the Filao is regarded as an excellent species for the regenerati of soil. However, there appears sooner or later a certain lack of balance in the telluric mic flora and this should incite the sylviculturist to consider replacing the second generation Fi by some other species promoting instead of inhibiting the mineralization process. *Subj Headings:* **1. Climate of Cape Verde peninsula 2. Sand dune stabilization 3. Afforestati 4. Cape Verde, French West Africa.**—*Authors' abstract.*

11.6–363 551.588.7:551.582.1(47

Gitis, I. I., **Dinamika klimata L'vova v mnogoletnem razreze.** [Climate dynamics Lvov over a period of many years.] *Gigiena i Sanitariia*, Moscow, No. 7:9–15, 1959. fi 3 tables, refs. English summary p. 15. **DLC** The author presents the results of an investig tion of the urban influence on the formation of local climate. A comparison of data bas on meteorological observations made in Lvov during two periods separated by a lengthy ti interval showed a change in the values of the main climate and weather components. T climate in Lvov has become warmer and slightly drier. As it is today, the climate in Lv is the result of modification of the local macroclimate under the combined influence of a ser of factors, viz: cutting down of the surrounding forests; drainage of ponds and marshes, exte sive construction of stone houses and constantly increasing territory of paved and asphalt high ways and sidewalks. *Subject Headings:* **1. Urban climatology 2. Climate of Lvov Lvov, Ukrainian S.S.R.**—*Author's abstract.*

SYNOPTIC CLIMATOLOGY

See also: **Synoptic studies** (Grappe), 11.6–246; **Weather type classification** (Gressel), 11.6–359

11.6–364 551.589 551.509.318 551.583.7(71

§*†Barry, Roger G., **A synoptic climatology for Labrador-Ungava.** McGill Univ., Montre Arctic Meteorology Research Lab., Contract AF 19(604)-3865, Scientific Report No. *McGill Sub-Arctic Research Papers*, No. 8; *Publication in Meteorology*, No. 17, Aug. 19 168 p. of text. 12 figs., 58 maps, 89 refs. **DWB**—A classification of air flow pattern types formulated for the region on the basis of synoptic weather maps for Nov., 1956 to March, 19 Regional indices of the zonal and meridional flow at mean sea level and the 500 mb level a examined in relation to the air flow types. The spatial and temporal variations of weath phenomena associated with the types are analyzed by quantitative weather parameters a the significance of the results is assessed with reference to local weather forecasting and pala climatic reconstructions. *Subject Headings:* **1. Synoptic climatology 2. Circulation typ 3. Labrador.**—*Author's abstract.*

11.6–365 551.589.1:551.509.3

†Pédelaborde, Pierre (*Université de Caen*), **Sur les méthodes de la climatologie physiq** [Methods of physical climatology.] *La Météorologie*, Paris, Ser. 4, No. 53:63–87, Jan./Mar **1959.** 53 refs. French, English and Spanish summaries p. 63. **DWB**—Pt. 1 of this arti reviews the synthetic and dynamic notions of climate. Pt. 2 criticizes the traditional clim tological methods, and Pt. 3 outlines a geographical method of physical climatology. T author criticizes the traditional conception of climate. Climatology is not only meant establish the geographical distribution of the mean values of temperature, rainfall, nebulosi etc., but it must necessarily restate lively and synthetic ideas; the climate being nothi else but the sum of the atmospheric conditions (type of weather) in their usual successi The technique of a climatologist must be such as to utilize the aerological and synoptic da (analysis of the daily weather situation) and then to determine the regional and local weath aspects as a function of the geography. A climatic chart must be kinematic and dynam calculations of the frequencies and durations of weather situation, description of season a

months, explanation of the mechanism, analysis of secular as well as irregular oscillations and the description of present climatic phase must be given. *Subject Headings:* **1. Synoptic climatology 2. Weather type frequencies.**—*A. V.*

11.6–366 551.589.1:551.582.2(699.21)

Van Loon, H. (*Weather Bureau, Pretoria*), **On the synoptic climatology of the Tristan da Cunha region.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. B*, Vienna, 9(3/4): 313–322, 1959. 5 figs., 6 tables, 5 refs. English, German and French summaries p. 313–314. **DWB, DLC**—A climatic summary of the observations made at Tristan da Cunha (approximately 37°S, 12°W) is presented, including only those elements which are representative of conditions over the open sea. An attempt is then made to describe the synoptic climatology of the area around the island by means of 10 basic weather types. Comparisons are drawn with New Amsterdam Island (approximately 38°S, 77.5°E) which show that meridional circulation types with a regular west–east movement are predominant in the South Atlantic Ocean. In the South Indian Ocean zonal circulation patterns prevail with a strong tendency for south–north movement. *Subject Headings:* **1. Climate of Tristan da Cunha 2. Synoptic climatology 3. Weather types 4. Tristan da Cunha.**—*Author's summary.*

MISCELLANEOUS

COSMIC INFLUENCES

See: **Lunar effects on birth** (Points), 11.6–64; **Solar-terrestrial relationships** (Pecker), 11.6–87; **Solar influences on chemicals** (Piccardi), 11.6–89, 11.6–90, 11.6–91; **Solar eclipse effects on atmos. elec.** (Kawamura, Kondo), 11.6–95; **Meteors** (Whipple, Hawkins), 11.6–97; **Meteor trail decay** (Hawkins, Howard), 11.6–98; **Meteor trails** (Hoffmeister), 11.6–99; **Meteor ionization** (Kotadia), 11.6–100; **Sunspot effects on cosmic rays** (Katzman), 11.6 109; **Solar-magnetic relationships** (Yokouchi), 11.6–135.

VISIBILITY AND OPTICAL PHENOMENA

See also: **Aerial mirror** (Shifrina, Anadreev), 11.6–15; **Visibility of stars** (Koomen), 11.6–92; **Sodium twilight glow** (Donahue, Stull), 11.6–128; **Sodium emission** (Nguyen), 11.6–129.

11.6–367 551.593.54:551.510.41:546.264

Báez P., A. and Fournier d'Albe, E. M. (*both, Instituto de Ciencia Aplicada, Mexico, D. F., Mexico*) **Carbon dioxide in study of medium scale diffusion.** *Advances in Geophysics*, N. Y., Vol. 6, pub. **1959.** p. 417–419. fig., ref. **DWB, DLC**—Despite the fact that it occurs naturally in the atmosphere in appreciable concentrations, the chemical inertness of carbon dioxide and the rapidity and precision with which it can be measured make it a suitable tracer for the study of the diffusion into the atmosphere of contaminants from large cities. Some preliminary data from Mexico show a high correlation between carbon dioxide concentration and atmospheric turbidity as measured by an actinometer. *Subject Headings:* **1. Carbon dioxide diffusion 2. Tracer elements 3. Diffusion measurement techniques.**—*Authors' abstract.*

11.6–368 551.593.54:523.74:551.593.7

Deirmendjian, Diran (*Rand Corporation, Santa Monica, Calif.*), **Theory of the solar aureole, *Pt. 2, Applications to atmospheric models.** *Annales de Géophysique*, Paris, 15(2): 218–249, April/June **1959.** 12 figs., 17 refs., 21 eqs. French and English summaries p. 218–219. **DLC**—The equation of radiative transfer for a moderately turbid atmosphere, discussed in Pt. I, is solved in a first approximation, and the component of skylight contributed by large particle scattering of sunlight at small angles is obtained. This component is expressed in a form that can be added directly to the known skylight values corresponding to multiple scattering in a Rayleigh atmosphere of the appropriate optical thickness. A few simple aerosol models

are described; their general characteristics are similar to those of natural aerosols in numbe density, size distribution, and stratification of particles, chosen so that the approximate scatter ing theory, outlined in Pt. I, is applicable. The required normalization factor for the scatterin matrix and some other parameters are defined and evaluated in terms of the aerosol character istics. Values of skylight intensity according to each model (assuming unit solar flux at a wavelengths) are then computed by the above method and are presented in various diagrams These show that in the region 15′ of arc from the sun's limb, the skylight should have an in tensity about ten times that at 10°, and that the brightness around the sun should fall off wit the cosecant of the angular distance. The blue color of the sky should gradually change t white in the vicinity of the sun and the aureole should appear redder with increasing sola zenith distance. The theoretical results are found to be in good agreement with existing obser vations as to brightness gradient, spectrum, and even some polarization features. A furthe extension of the present theory is suggested to better explain the observed polarization an position of neutral points. The conclusion is reached that a careful analysis of good aureol data is one of the most sensitive tools of research in the investigation of atmospheric turbidit at all levels. (For Pt. 1, *see* 9.11–296, Nov. 1958, *MAB.*) *Subject Headings:* **1. Solar aureol 2. Atmospheric models 3. Radiative transfer through turbid atmosphere 4. Atmospheri turbidity 5. Polarization 6. Neutral points.**—*Author's abstract.*

11.6–369 551.593.65

Deirmendjian, Diran and Vestine, E. H. (*both, Rand Corp., Calif.*), **Some remarks on th nature and origin of noctilucent cloud particles.** *Planetary and Space Science*, N. Y., 1(2):146 153, April **1959.** 2 figs., table, 11 refs., 2 eqs. **DWB**—Continuous spectra of the light fro noctilucent clouds, recently obtained by N. I. Grishin near Moscow, U.S.S.R., are analyze after accounting for the selective attenuation of the lower atmosphere and the spectrum c sunlight. It is found that the spectra may be explained in terms of primary scattering c direct sunlight by dielectric spheres with a maximum radius of 0.4μ, and certain night sk emissions. The apparent absence of any nocturnal ozone layers above 35 km is also note The possibility of an ice composition of the clouds formed by condensation of terrestrial wat vapor is examined and found unjustified on physical grounds. Rather a silicaceous or simil composition and an interplanetary origin for the cloud particles is favored and a close relatio with the Martian "blue haze" is suggested. *Subject Heading:* **1. Noctilucent clouds.**—*Autho abstract.* Ⓢ

ELECTRICAL PHENOMENA

See also: **Electron density** (De Jager), 11.6–82; **Solar eclipse effects on atmos. elec.** (Kawamura, Kondo), 11.6–95; **Potential gradient** (Maund, Chalmers), 11.6–240; **Elec. charge near the ground** (Smiddy, Chalmers), 11.6–241; **Thunderstorm elec.** (Grenet), 11.6–328.

11.6–370 551.594(234.

Israël, Hans, **Luftelektrische Erfahrungen in den Schweizer Alpen.** [Atmospheric ele tricity data in the Swiss Alps.] *Germany. Deutscher Wetterdienst, Berichte*, 8(54):33–3 **1959.** 6 figs., table, 7 refs. German and English summaries p. 33. **DWB, DLC**—Atmospher electric registrations were carried out during one year's period at two stations situated in t high mountain ranges of the Swiss Alps (Jungfraujoch and Gornergrat) and at two flatla stations situated in the north and the south of the Alpine range (Payerne and Isole di Brissago these registrations were connected with meteorological observations. Some results obtain are mentioned and discussed especially with reference to the atmospheric electric separati problem. *Subject Headings:* **1. Atmospheric electricity data 2. Electric charge separati 3. Swiss Alps.**—*Author's abstract.*

11.6–371 551.594.1:551.510.721(5

Kondo, Goro, **The recent status of secular variations of the atmospheric electric elemen and their relation to the nuclear explosions.** *Kakioka, Japan. Magnetic Observatory, Memoi* 9(1):2–6, March **1959.** 5 figs., 7 refs. Japanese summary p. 2. **DWB**—The recent stat of secular variations of the atmospheric electric elements for calm days at Kakioka seems to

normal. In this paper, the author first reports the observational details of this abnormality nd then discusses its probable causes from various atmospheric electric and meteorological andpoints. Finally, he finds an intimate connection between the abnormal changes of the mospheric electric elements and artificial radioactivity due to the test explosions of the nuear bombs, referring the results at some other stations in the world. *Subject Headings:* **Atmospheric electricity variations 2. Nuclear explosion effects on atmospheric electricity Secular electricity variations 4. Kakioka, Japan.**—*Author's introduction.*

11.6–372 551.594.22:517.512.2(45)

Bruckmann, G.; Fritsch, V. and Mosetti, F. **Alcune considerazioni di carattere statistico ull'incidenza dei danni per scariche elettriche atmosferiche.** [Some considerations on the atistical nature of the incidence of damage from atmospheric electric discharges.] *Tecnica taliana*, Trieste, 24(1):1–14, Jan./Feb. **1959.** fig., 3 tables, 15 refs. Reprinted as *Trieste. bservatorio Geofisico Sperimentale, Pubblicazioni*, No. 99, **1959. DWB** (M94.2213 B888aL)—n elaborate method is devised and presented for statistical evaluation of the lightning risk n any given place and season, and application is made to Italy and Austria. A large map nows lightning risk in each province of Italy, Sicily and Sardinia. Tables show probabilities or given periods of time. Periodic analysis is applied in this development. *Subject Headings:* **. Lightning risk calculation 2. Lightning frequency in Italy 3. Italy.**—*M.R.*

AURORAS

See: **Sec. D3,** p. 851.

SFERICS

See: **Whistler research** (Helliwell), **11.6–21.**

PART II. RECENT LITERATURE ON THE IONOSPHERE

Compiled by: Geza Thuronyi

INTRODUCTORY NOTE

This is the third and last in a series of compilations on the ionosphere. As stated before, the close to 500 items contained in this series have not been selected in any systematic manner but have merely accumulated in our regular process of covering current meteorological literature. For more thorough search, previous issues of *Meteorological Abstracts*, including a bibliography on **Ionospheric propagation** in Vol. 6, No. 4, April **1955** should be consulted. In order to facilitate the use of the three compilations in the April, May and this issue, the *Outline of Contents* which follows includes references to all three.

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(Including references to the two preceding bibliographies)

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11F–1 551.507.362.2 :551.506.7 :551.510.535

Aitchison, G. J. and Weekes, K. (*both, Cavendish Lab., Cambridge*), **Some deductions of ionospheric information from the observations of emissions from satellite 1957α 2, Pt. 1, The theory of analysis.** *Journal of Atmospheric and Terrestrial Physics,* New York, 14(3/4) :236–243, June 1959. fig., 2 refs., 16 eqs. **DWB, DLC.** Also: Aitchison, G. J.; Thomson, J. H. and Weekes, K., **Pt. 2, Experimental procedure and results.** *Ibid.,* p. 244–248. fig., 2 tables, 4 refs. **DWB, DLC**—The launching of the first artificial earth satellite (1957α) by the U.S.S.R. provided an opportunity of obtaining information about the ionosphere at heights above the F2-peak. The satellite emitted radio waves of frequency 20 and 40 Mc/s which were appreciably modified during their transmission through the ionosphere to the ground. It should therefore be possible to obtain information about the distribution of ionization by making suitable observations on the received wave. It turns out

that the most useful quantities for this purpose are the Doppler frequency shift and the fading of the signal caused by the magneto-optical Faraday effect. It is the purpose of the first paper to develop an approximate theory of these two phenomena and to use it to interpret some observations. Conclusions given in the second paper are: (1) The analysis of the FARADAY fading suggests that the ionization density above the maximum of F2 at night decreases only slowly and that at 100 km above h_mF2 it has not decreased by more than 20%. These results are tentative because of the inaccurate knowledge of the orbit for 1957α2 and because the analysis itself is only approximate. (2) The best Doppler records, although not sufficiently accurate for detailed analysis, do not appear to be in disagreement with these conclusions. (3) If full advantage is to be taken of the information available in the transmissions from future satellites it is highly desirable that accurate orbit data should be available as a result of visual observations and that records of the Doppler effect should be made continuously and automatically at several receiving sites. *Subject Headings:* **1. Soviet satellite, Alpha two 2. Satellite ionospheric observations.**—*Authors' abstracts.* Ⓢ

11F–2 551.594.6:551.510.535:551.594.11

Allcock, G. McK. (*Dominion Physical Lab., Lower Hutt, New Zealand*), **The electron density distribution in the outer ionosphere derived from whistler data.** *Journal of Atmospheric and Terrestrial Physics*, New York, 14(3/4):185–189, June **1959.** 8 figs., table, 13 refs., 21 eqs. **DWB, DLC**—A method, using successive approximations, is given for finding the variation of electron density N with height h in the outer ionosphere, when the variation of whistler dispersion with geomagnetic latitude is already known. From the application of the method to specific whistler data, it is inferred that the electron density distribution in the outer ionosphere decreases exponentially with height at least in the height range 1000 to 13,000 km, and that during the period January to May 1957 the equation describing the distribution within this height range was: $N \doteqdot 5.75 \times 10^{6} \exp(-h/2640)$ where N is in cm^{-3} and h in km. *Subject Headings:* **1. Ionospheric electron density distribution 2. Whistler data.**—*Author's abstract.* Ⓢ

11F–3 551.510.535:551.594.12:523.74

Allen, C. W. (*Univ. College, London*), **World-wide diurnal variations in the F2 region.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(1/2):53–67, **1953.** 11 figs., 5 tables, 9 refs. **DWB**—A study has been made of the diurnal variations of F2 critical frequencies and virtual heights as a function of phase of sunspot cycle, season, and geographic and geomagnetic position. The main results are derived from ten stations that are well observed at both sunspot maximum and minimum. The chief characteristics of *fo*F2 may be described in terms of (a) the sunspot minimum anomaly, (b) the sunrise anomaly, and (c) the diurnal range anomaly. The features of these anomalies are evaluated quantitatively and as far as possible, the anomalies are extracted from the data to determine the normal curves. The world distributions of indices representing the anomalies are studied. The variations of the F2 virtual height are not related in any very significant manner to either the sunspot cycle or the *fo*F2 diurnal curves. Some attempt at explanation of the anomalies has been made but no complete theory is available. Some effects are thought to be thermal or tidal oscillations, and evidence is given for the conclusion that F2 electrons disappear by a decay law that is independent of gas pressure. *Subject Headings:* **1. Diurnal ionospheric variations 2. Ionospheric anomalies 3. F2 layer 4. foF2 disturbances 5. F2 layer critical frequencies.**—*Author's abstract.*

11F–4 551.510.535:621.39

Al'pert, Ia. L., **O metode issledovaniia ionosfery s pomoshch'iu iskusstvennogo sputnika Zemli.** [Method of ionospheric investigation by means of artificial earth satellites.] *Uspekhi Fizicheskikh Nauk*, Moscow, 64(1):3–14, Jan. **1958.** 3 figs., 7 refs., 34 eqs. **DWB, DLC**—Among various problems, to the solution of which rockets and artificial earth satellites can contribute, the author considers the following three: 1) investigation of the relationship of electronic concentration N and the effective number of collisions r upon height z; 2) the nature and causes of the statistical instability of the ionosphere and 3) the attempt to obtain a true understanding of the process of ionization and de-ionization and the construction of a theory accounting for the formation of different ionospheric layers. The author examines the method of investigating the ionosphere with the aid of an artificial earth satellite having an elliptical orbit whose closest approach to the earth is in the F2 layer (250–300 km) and an apogee up to ~800~900 km situated above regions where the electron concentration of the F2 layer is a maximum. Since the speed of the satellite in its orbit is approximately 8 km/sec the ratio method can use the Doppler effect to analyze the measurements so that the values of a series of ionospheric parameters can be obtained. The entire number of electrons in a column of 1 cm^2 cross-section extending from the lower level of the ionosphere to height z_0 of the satellite during the period of passage above the observer is given by $N_p(z_0) = \int_0^{zc} N_{dz}$. Under certain conditions (in an undisturbed ionosphere) the electron concentration is given by $N_0 = N(z_0)$. The magnitudes m_0 and the characteristics of the fluctuations of electron density and the linear dimensions of

inhomogeneous formations along the course of the satellite can be determined in some instances. The method of measurement is described with the aid of the relevant equations. The results of measurement are analyzed for the case when $N = N(z)$ and when $N(X_1 z) = N(z)\,[1 + m \cos(2\pi/\Lambda)\,x]$. The expected values of measured magnitudes and their precision for given ionospheric parameters are examined. *Subject Headings:* **1. Satellite ionospheric observations 2. Ionospheric measurements 3. Soviet satellite investigations.**—*I.L.D.*

11F–5 551.510.535:621.396.8

Anderson, J. M. and Goldstein, L. (*both, Dept. of Electrical Engr., Univ. of Illinois*), **Interaction of electromagnetic waves of radio-frequency in isothermal plasmas: collision cross section of helium atoms and ions for electrons.** *Physical Review*, New York, 100(4):1037–1046, Nov. 15, **1955.** 5 figs., 28 foot-refs., 38 eqs. **DLC**—The elements of the theory of interaction of radio-frequency electromagnetic waves in gaseous discharge plasmas are reviewed. The applicability of this phenomenon of wave interaction to the measurement of quantities involved in fundamental processes in such plasmas is considered. A measurement of the "effective" electron-atom collision frequency in helium, found to be 3.12×10^6/sec/mm Hg for room temperature electrons ($\sim$300°K), gives a value for the probability of collision for momentum transfer, P_m, of the helium atom equal to 24.0 cm^2/cm^3 at 0°C and 1 mm Hg. An experimental determination of the "effective" electron-ion collision frequency (for singly charged ions) has also been determined which closely agrees with earlier theoretical predictions. The ratio of the effective cross sections, associated with electron collisions, of ions and helium atoms in the room temperature isothermal plasma is $\sim 3.0 \times 10^5$ at an ion density of 10^{11}/cm^3. *Subject Headings:* **1. Ionospheric cross modulation 2. Microwave interaction.**—*Authors' abstract.*

11F–6 551.510.535:523.75

†Bailey, D. K. (*Page Communications Eng. Inc., Wash., D. C.*), **Disturbances in the lower ionosphere observed at VHF following the solar flare of Feb. 23, 1956 with particular reference to auroral-zone absorption.** *Journal of Geophysical Research*, Wash., D. C., 62(3):431–463, Sept. **1957.** 4 figs., 4 tables, 65 refs., 19 eqs. **DLC**—Observations at the time of the great solar flare of 23 Feb. 1956 of oblique-incidence signal intensities and simultaneous observations of the background cosmic noise were made at VHF for a number of high-latitude communication links employing the ionospheric-scatter mode of propagation. During the flare and for some hours afterward, all paths lay in the dark hemisphere. Virtually synchronously with the arrival of solar cosmic rays, a sharp signal-intensity enhancement was observed, which is tentatively explainable if it is supposed that the first-arriving solar cosmic rays were predominantly of positive charge. The unusually stable night-time absorption which developed in one to three hours after the flare and the much greater following daytime absorption are explained in some detail as consequences of the deposition in the D region of moderately heavy solar atomic ions, such as calcium, having ionization potentials low compared with the normal atmospheric constituents. The absorption effects, which were limited to fairly high geomagnetic latitudes, gradually died away over a period of several days. The absence of significant magnetic disturbance and unusual auroral activity for nearly 48 hrs after the flare is shown to be in accord with the suggested explanation of the absorption effects. Asymmetry about local noon was observed in the absorption effects on signal intensity, for which an explanation is suggested. *Subject Headings:* **1. Solar flare effects on ionosphere 2. Auroral absorption zone 3. Solar flare, Feb. 23, 1956.**—*Author's abstract.*

11F–7 551.501.81:551.510.535(98)

Bates, Howard F. (*Geophys. Inst. Univ. Alaska, College, Alaska*), **The height of F-layer irregularities in the Arctic ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1257–1265, Sept. **1959.** 5 figs., 10 refs., 14 eqs. **DLC.** Also issued as Alaska. Univ. Geophysical Institute, Contract AF 19(604)-1859, Scientific Report No. 3, March **1959.** 19 p. 6 figs., 12 refs., 17 eqs. **DWB**—Results and interpretations of oblique-incidence soundings of the arctic ionosphere are presented. Anomalous echoes are found to be prevalent in high latitudes in contrast to lower latitudes where 2F groundscatter predominates. One of the echoes seen regularly at College, Alaska, has been identified as direct F-layer (1F) back scatter propagated via the least-time mode. The observations of the 1F echo provide direct evidence of the presence of irregularities in the F layer between heights of 350 and 500 km. The 1F echoes are recorded regularly at night and occasionally during the day in disturbed periods. They appear to be associated with auroral ionization. The analysis of ground-scattered (2F) echoes is extended from a plane to a spherical geometry, and it is shown that a geometrical extension of the plane-earth theory is adequate. The observed range-frequency dependence differs only slightly from that predicted by the latter theory. *Subject Headings:* **1. Arctic ionosphere 2. Radio echoes from ionosphere 3. F layer height 4. Arctic.**—*Author's abstract.* Ⓢ

11F–8 551.510.52:551.510.535

Bauer, Siegfried J. (*U. S. Army Signal Eng. Lab., Fort Monmouth, N. J.*), **A possible troposphere-ionosphere relationship.** *Journal of Geophysical Research*, Wash., D. C., 62(3):425–430, Sept. 1957. 2 figs., 6 refs. **DLC**—Minimum virtual height and critical frequency of the ionospheric F2 layer are analyzed by means of the superposed epoch method. Results of this analysis, on the basis of their statistical significance, suggest a relationship between frontal passage in the troposphere and F2-layer characteristics. The observed effects are interpreted qualitatively in the light of a hypothesis suggested by MARTYN, and seem to be consistent with the concept of a dynamic coupling between lower and upper atmosphere. The results of this analysis are also found to agree with previously reported troposphere-ionosphere correlations. *Subject Headings:* **1. Troposphere-ionosphere relationships 2. Ionospheric critical frequencies 3. Frontal passages.**—*Author's abstract.*

11F–9 551.510.535:551.594.13:523.164.83

Bauer, Siegfried J. and Daniels, Fred B. (*both, U. S. Army Signal Res. & Dev. Lab., Ft. Monmouth, N. J.*), **Measurements of ionospheric electron content by the lunar radio technique.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1371–1376, Oct. **1959.** 7 figs., 9 refs., eqs. **DLC**—Measurements of the Faraday rotation of lunar radio echoes on a frequency of 151 Mc/s are used to determine the time variation in the total ionospheric electron content. Absolute values of ionospheric electron content are determined from these measurements in conjunction with information on the electron content below the F2 peak computed from vertical-incidence sounding data. Diurnal, day-to-day, and seasonal variations in the total electron content are presented. The ratio $n_a:n_b$ of the number of electrons above the F2 peak to that below is found to be in the order of 4 to 5 during three summer nights (June) before sunrise and about equal to 3 after sunrise. For two days in Nov. the ratio $n_a:n_b$ is found to be equal to about three both before and after sunrise. Possibilities of inferring other characteristics of the upper ionosphere from observed variations in the total electron content are briefly discussed. *Subject Headings:* **1. Ionospheric electron density measurement techniques 2. Lunar radio reflections.**—*Authors' abstract.* Ⓢ

11F–10 551.510.535:523.78

Bibl, K. and Delobeau, F. (*both, Ionsph. Station Neuershausen, Freiburg i. Br.*), **Ionosphärische Beobachtungen während der totalen Sonnenfinsternis vom 30. Juni 1954.** [Ionospheric observations during the total solar eclipse of June 30, 1954.] *Zeitschrift fur Geophysik*, Würzburg, 21(4/5):215–228, **1955.** 5 figs., 3 tables, 12 refs., 6 eqs. English summary p. 215. **DLC** (QC801.Z4)—The eclipse has been observed under very favorable circumstances with a panoramic ionosonde for recording of critical frequencies and a second ionosonde for absorption work. The diminution of maximum ionization N_m was 79% for E and 69% for F1. As to F2 the decrease was about 40%. The recombination law has been studied by comparison with the median variation of the control days. The recombination term in the continuity equation was written $\alpha_n \cdot N_m{}^n$, the parameter n has been found by comparison with the minimum value of N_m. For E and F1 we thus found $n=3$, but the conventional exponent $n=2$ may be right, if the effective radius of the solar disk was larger than the optical one by 2%. The recombination coefficient was appointed with different hypotheses for n by three methods: a) from the time lag Δt, b) from a comparison of a calculated screening with the optical curve, c) from the value of dN/dt during totality. With all these methods rather high recombination values have been found. With the conventional exponent $n=2$ we obtain α_0-values of $\geq 1 \cdot 10^{-7}$ cm^3 s^{-1} for E and $\approx 3 \cdot 10^{-8}$ cm^3 s^{-1} for F1. *Subject Headings:* **1. Solar eclipse effects on ionosphere 2. Ionosondes 3. Solar eclipse, June 1954.**—*Authors' abstract.*

11F–11 551.510.535:550.385.4

Booker, H. G. (*Cornell Univ., Ithaca, N. Y.*), **Morphology of ionospheric storms.** *National Academy of Sciences, Proceedings*, 40(10):931–943, Oct. **1954.** 9 figs., 3 refs. **DWB**—The accepted variations in the geomagnetic field as revealed by magnetic records during magnetic storms (in the D and E-layers) compared with conditions during quiet days; and of the F2 layer during ionospheric storms in different latitudes and different solar epochs (or storm-time variations) are discussed and illustrated by composite graphs. Many problems remain unsolved, although the general features are clear-cut. It is hoped that observations during IGY will help resolve many of these problems. *Subject Headings:* **1. Ionospheric storms 2. Geomagnetic storms 3. IGY ionospheric program.** —*M.R.*

11F–12 551.594.13:551.510.53:551.510.535

Bourdeau, R. E.; Whipple, E. C., Jr. et al. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **Analytic and experimental electrical conductivity between the stratosphere and the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1363–1370, Oct. **1959.** 5 figs., 19 refs., 13 eqs. **DLC**—Data on atmospheric conductivity obtained experimentally in the altitude region between 35 and 80 km by use of rocket-borne Gerdien condensers are presented. Analytic expressions based on ion

equilibrium and ionization by cosmic rays only are derived for comparison. The experimental technique is described, and several factors that might influence the measurements are evaluated. There is good agreement between the measured and predicted values of negative conductivity at altitudes up to 50 km. Low conductivity values observed between 50 and 80 km are attributed to ionic diffusion to particulate matter, the reduction agreeing quantitatively with that calculated from present estimates of the radius and concentration of noctilucent cloud particles. It is suggested that meteoritic dust may be an important agent for electron destruction in the ionosphere. *Subject Headings:* **1. Electrical conductivity between stratosphere and ionosphere 2. Ion equilibrium 3. Cosmic ray ionization. I. Clark, J. F.**—*Authors' abstract.* Ⓢ

11F–13 551.510.535:551.594.12:551.510.62

Bowles, Kenneth L., **Incoherent scattering by free electrons as a technique for studying the ionosphere and exosphere: observations and theoretical considerations.** *U. S. National Bureau of Standards, NBS Report* 6070, Sept. 18, **1959.** 39 p. 12 figs., table, 17 refs., 12 eqs. **DWB** (621.384 U585in)—Incoherent scattering by the free electrons of the ionosphere has been predicted and offered as a technique for measuring the electron density profile both below and above the F region maximum. This paper reports observations which confirm the existence of the incoherent scatter and show that its intensity is essentially the predicted value. The observed Doppler broadening is considerably smaller than predicted. In the second part of the paper, an explanation for the reduced Doppler broadening is offered. The scatter is explained as arising from statistical fluctuations of electron density, the distribution of which is controlled by the positive ions. Computations of the temporal autocorrelation function, and related power spectrum, of the scatter are presented. An additional possibility of using the incoherent scatter for mass-spectrometer measurements of the ionic constituents is outlined. *Subject Headings:* **1. Ionospheric electron density measurements 2. Ionospheric scattering.**—*Author's abstract.*

11F–14 551.508.96:551.510.535

Brown, J. N., **Automatic sweep-frequency ionosphere recorder, Model C-4.** *Institute of Radio Engineers, N. Y., Proceedings,* 47(2):296–300, Feb. **1959.** 3 figs. (incl. photos), 4 refs. **DLC**—An improved sweep-frequency ionosphere recorder was needed to carry out the expanded program of observation planned for the IGY. The resulting equipment included improvements in output power, receiver sensitivity, purity of output signal, and other details, over earlier equipments. The basic principles of operation are described and the transceiver-type of circuitry explained. The operating characteristics are: frequency range, 1–25 Mc; output power, 10–30 kw peak pulse power; pulse length, 50 μ sec; repetition rate, variable from 10–70 pulses per second. An elaborate control and programming system is provided which can be used to operate the equipment on an unattended automatic basis. The "virtual height" of the ionospheric layers, as a function of frequency, is recorded on photographic film by two cameras—a 35-mm uniformly-moving-film unit, and a frame-by-frame 16-mm camera, which produces time-lapse motion pictures of the changes which occur. A brief history of the development of the sweep-frequency recorder technique is given. *Subject Headings:* **1. Ionospheric recorders 2. IGY Ionospheric program.**—*Author's summary.* Ⓢ

11F–15 551.510.535:551.510.62:551.510.534(99)

Busch, Robert and Luchet, Aimé, **Sur une trace d'écho de caractère singulier observée sur les ionogrammes de la station des îles Kerguelen.** [Record of a singular echo found in the ionograms of the Kerguelen Islands Station.] *Académie des Sciences, Paris, Comptes Rendus,* 241(5):507–509, Aug. 1, **1955.** 2 figs., 3 refs. **DLC**—For several years echoes from a low level have been observed during ionospheric soundings in the Southern Hemisphere. In this note further evidence of the existence of a low reflecting layer is produced. The soundings reported were made at Port-aux-Français, Kerguelen Islands, in 1953 and 1954 and at Bergen, Norway, in 1954. The virtual height of the reflections recorded is 48–55 km in summer and 55–65 km in winter. This height coincides with the upper boundary of the ozone layer (a region of temperature maximum). There is no evidence of a critical frequency. Two ionograms clearly showing the low-level reflections are presented. *Subject Headings:* **1. Ionospheric echoes 2. Ionograms 3. Kerguelen Islands.**—*G.T.*

11F–16 551.510.535:551.594.13:551.590.24

Busch, R.; Harnischmacher, E. and Rawer, K. (*all, Service de Prévision Ionosphérique Militaire*), **Observations ionosphériques effectuées durant l'éclipse solaire du 30 juin 1954 à Fribourg.** [Ionospheric observations made during the solar eclipse of June 30, 1954 at Freiburg.] *Annales de Géophysique,* Paris, 12(1):1–15, Jan./March **1956.** 13 figs., table, 8 refs., 9 eqs. English summary p. 1. **DLC**—The variation of the electron density of the E layer corresponds to a law with the 0.6 power of the radiation, the same as obtained from the normal daily variation. The absorption figures must be interpreted as the result of a decreasing D layer absorption plus a selective E layer absorption the latter increasing during the eclipse. With this analysis a power-law with an exponent

1.1 is found for the nondeviative absorption. Oblique incidence observations also indicate an important decrease of D layer absorption during the eclipse. *Subject Headings:* **1. Ionospheric electron densities 2. Solar eclipse effects on electron density 3. Solar eclipse, June 1954 4. Freiburg, Germany.**—*Authors' abstract.*

11F–17 551.507.362.1:550.380.8 551.510.535:551.594.13(988)

Cahill, Laurence J., Jr., (*Univ. of New Hampshire*), **Detection of an electrical current in the ionosphere above Greenland.** *Journal of Geophysical Research*, Wash., D. C., 64(10):1377–1380, Oct. **1959.** 6 figs., 4 refs. **DLC**—During a magnetic storm on August 6, 1957, a rocket-borne magnetometer was launched near the coast of Greenland. The time and location of the flight and the magnetic measurements obtained provide evidence that the rocket entered the postulated sheet current flowing across the polar cap. An estimate is made of the magnitude of the detected current. *Subject Headings:* **1. Rocket-borne magnetometers 2. Ionospheric electrical currents 3. Greenland.**—*Author's abstract.* Ⓢ

11F–18 551.594.51:551.510.535:551.594.12

Chapman, Sydney (*Geophysical Inst., College, Alaska*), **Disturbances in the lower auroral ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):29–37, Sept. **1959.** 2 figs., table, 16 refs. **DLC**—The solar particles that enter the atmosphere and produce the luminous aurora are known to include protons, which also ionize the atmosphere. As suggested by Bates, their ionizing action may extend below the level of their own penetration, by the Lyman α-photons they emit. These can penetrate to about 75 km, and ionize nitric oxide. Recent rocket researches by Van Allen and his colleagues prove that the primary auroral particles also include electrons with energies up to 100 keV. These penetrate to about 80 km, thus directly extending the auroral ionization well below the level of auroral luminosity. Indirectly these electrons ionize the atmosphere down to far lower levels, by the X-rays emitted by a small fraction of the electrons. Winckler's balloon results show that such ionization extends at least down to 32 km. This ionization below the level of the visible aurora accounts for most of the absorption, in auroral regions, of high frequency radio waves. Though the primary electron flux at night probably exceeds that by day, the secondary electrons are often more numerous (and absorbent) by day than by night. This is because, by day, photodetachment prolongs the free life of these electrons, despite their ready attachment to oxygen. *Subject Headings:* **1. Auroral ionosphere 2. Ionospheric ionization 3. Auroral ionization.**—*Author's abstract.* Ⓢ

11F–19 551.510.535:523.755

Chapman, Sydney, **The outermost ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 15(1/2):43–47, Sept. **1959.** 10 refs. **DLC**—Speculations made by the writer regarding the extension of the solar corona up to and beyond the earth's orbit are considered in connection with the constitution of the outer ionosphere, above the F2 peak. If the sun's magnetic field is radially limited so as not to affect the outward flow of heat from the corona, the earth must be immersed in a very hot (200,000°) interplanetary atmosphere mainly consisting of ionized atomic hydrogen—the protons and electrons numbering about a thousand per cubic centimeter. Heat must flow from this gas into the earth's atmosphere. Above the F2 peak the atmosphere will first consist increasingly of ionized atomic oxygen, under-lying an extensive layer of nearly neutral atomic hydrogen. The temperature continually increases upwards and at high levels the atomic hydrogen gradually merges with the interplanetary gas. Above the neutral hydrogen layer, the heat inflow is greatest in polar latitudes. *Subject Headings:* **1. Outer ionosphere 2. Solar corona-ionospheric heat flow.**—*Author's abstract.* Ⓢ

11F–20 523.74:551.510.535:551.594.13

Chatterjee, B. (*Indian Inst. of Technology, Kharagpur, India*), **Discussion on the variation of F-region height.** *Journal of Geophysical Research*, Wash., D. C., 60(3):325–327, Sept. **1955.** fig., 3 refs. **DLC**—Variations of F2-region height with season and solar activity have been explained in terms of the author's picture of ionization distribution in the F region. Different types of behaviors of F2-region height at different latitudes are accounted for with the presently accepted model of temperature distribution in the upper atmosphere. *Subject Headings:* **1. F2 layer height variations 2. F layer ionization.**—*Author's abstract.*

11F–21 551.510.535:551.594.13 621.396.8

Chivers, H. J. A. and Wells, H. W. (*both, Jodrell Bank Experimental Station, Manchester Univ.*) **A new ionospheric phenomenon.** *Nature*, London, 183(4669):1178, April 25, **1959.** fig., 5 refs. **DWB**—In order to eliminate man-made noise and interferences, a special study of some unusual radiations began at Jodrell Bank in Oct. 1958. Five separate total-power receivers, slightly differing but near 80 Mc/s were used; three receivers were at Jodrell Bank, the other two at separate sites a

km distance. Some ten instances of isolated increase of the noise level were recorded by some of the instruments while others simultaneously recorded decrease during the period Jan. 3–10, 1959. Again, on March 25, 1959 at 1400 U.T. a very striking isolated event occurred. Facsimile recordings are given. Preliminary investigations of these rare, seemingly precursors of stepped-up solar activity and subsequent magnetic storms and auroras, show no unusual solar or terrestrial effect or relationships. *Subject Headings:* **1. Radio noise 2. Ionospheric recorders 3. Whistling sferics.**—*W.N.* Ⓢ

11F–22 551.510.535:551.594.13

Chvojková, E. (*Astrophys. Obs., Ondrejov, Czechoslovakia*), **Über die Entstehung der F1-Schicht.** [Origin of the F1 layer.] *Bulletin of the Astronomical Institutes of Czechoslovakia*, Prague, 4(5):101–109, **1953.** 6 figs., 8 refs., 24 eqs. Russian summary p. 108–109. **DLC**—Evidence is produced to show that the splitting of the F-layer may be explained by a thermal effect rather than by the ionization of two different gases. The highest temperature will be produced in the region of maximum ion production; thus in this region atmospheric and electronic density will be lower than in adjoining regions. After sunrise the nocturnal F layer will split into two regions, F1 and F2. As the maximum ion production occurs below the middle of the layer, the F1 region is considerably thinner than the upper F2 region. The higher the sun rises above the horizon, the more the atmosphere will dilate and the farther the two newly-formed regions will move from each other. The secondary maximum of critical frequency for the F layer, which occurs at night, may also be explained by the layer's temperature. *Subject Heading:* **1. F1 layer formation.**—*Transl. of author's abstract.*

11F–23 551.510.535:551.508.96

Cones, H. N.; Cottony, H. V. and Watts, J. M., **A 600-ohm multiple-wire delta antenna for ionosphere studies.** *U. S. National Bureau of Standards, Journal of Research*, 44(5):475–488, May **1950.** 11 figs. **DWB**—This paper describes the design and the performance of a multiple-wire delta antenna developed for use with high output impedance, vertical-incidence ionosphere sounding equipment. Graphs are presented showing the terminal impedance of this antenna over the separating frequency range (1 to 25 Mc), using various lengths of open-wire transmission line. The results of pattern measurements using model techniques are given, showing the expected radiation characteristics of the full-scale antenna. A practical test of the comparative merits of the antenna is described in which ionosphere records obtained by the use of this antenna are compared with those obtained by the use of a larger antenna developed previously. *Subject Headings:* **1. Ionospheric sondes 2. Multiple-wire delta antennas.**—*Authors' abstract.*

11F–24 551.510.535:662.2:539.1

Cummack, C. H. and King, G. A. M. (*both, Geoph. Obs., New Zealand*), **Disturbance in the ionospheric F-region following the Johnston Island nuclear explosion.** *Nature*, London, 184(4688):32–33, Sept. 5, **1959.** 2 figs., 2 refs. **DWB**—On Aug. 1 and 12, 1958 the U. S. exploded hydrogen bombs near Johnston Island at heights of 160 km and 100 km. This report describes one of the effects of this explosion on the ionospheric F-region. There was a characteristic movement among the magnetic vectors identified with the passage of the F-region disturbance that occurred after the explosion, as revealed from ionograms at Christchurch, 44°S, and Campbell Island, 53°S. *Subject Headings:* **1. Ionospheric disturbances 2. Nuclear explosion effects on ionosphere.**—*N.N.* Ⓢ

11F–25 551.510.535:551.594.13:523.164.83

Daniels, Fred B. and Bauer, Siegfried J. (*both, U. S. Army Signal Engineering Labs., Fort Monmouth, N. J.*), **Measurement of the ionospheric Faraday effect by radio waves reflected from the moon.** *Nature*, London, 181(4620):1392–1393, May 17, **1958.** 2 figs., 2 eqs. **DWB**—Using the rotation of the plane of polarization of radio echoes from the moon, it is possible to determine the change in total electron content of the ionosphere. This is a report on such an experiment made the night of Jan. 8–9, 1958. Results indicated a change about 2.2 times that computed for a parabolic layer using vertical sounding data recorded at the transmitting site. *Subject Headings:* **1. Radio echoes from moon 2. Ionospheric electron densities.**—*Based on Physics Abstracts*, No. 5543, 1958.

11F–26 551.510.535:551.594.13

Delobeau, François, **La stratification $F_{1,5}$ à Dakar et le mouvement du soleil.** [$F_{1,5}$ stratification at Dakar and motion of the sun.] *Académie des Sciences, Paris, Comptes Rendus*, 235(25):1573–1675, Dec. 22, **1952.** 2 figs., 3 refs. **DWB**—The F region of the ionosphere contains normally (during the day) 2 distinct layers—the F and Fe layers. A supplementary stratification called $F_{1,5}$ by the French Service of military ionospheric forecasting, appears often in the subtropical regions. The hours of its presence and its importance vary from hour to hour, and day to day during the year and its existence causes a notable reduction of the degree of maximum ionization of both F layers.

The author aims to show evidence of the influence of diurnal and seasonal periodicities upon the law of frequency in time. Graphs for the period July 1949–July 1952 showing the number of appearances of $F_{1,5}$ during summer, winter and the equinoxes, and its annual variation for Dakar are presented. Similar surveys have already been given for Singapore (1949). The author concludes that if the existence of $F_{1,5}$ can be explained by large-scale movements of ions over the equatorial zone—it seems that their regime differs according to regions and that there is reason to assume an influence of magnetic characteristics. Similar results obtained at numerous stations would reveal the effect of these characteristics. *Subject Headings:* **1. Ionospheric stratification 2. Dakar, French West Africa.**—*A.M.P.*

11F–27 551.510.535:551.501.

Delobeau, F., **Nouvelle représentation de l'effet de longitude dans la couche ionosphérique F2.** [A new representation of the effect of longitude on ionospheric F2 layer.] *Académie des Sciences, Paris, Comptes Rendus,* 241(4):439–441, July 25, **1955.** fig., 4 refs., eqs. **DWB**—To investigate the effect of longitude on the F2 layer, a new graphic representation is suggested wherein geographic latitude (N or S) is represented by the abscissa and the inclination (N or S) by the ordinate distance. The curve for the main magnetic observatories is shown as plotted for geographic and for magnetic coordinates. Areas where stations are wanting appear on these curves. Effect of oceans is considered important both with respect to effect on F2 layer and to missing values. *Subject Headings:* **1. Longitude effects on F2 layer 2. Oceanic effects on F2 layer 3. Graphical presentation of ionospheric data.**—*M.R.*

11F–28 551.510.53

*Dominici, Piero, **Andamento della ionosfera a Roma nel periodo 1948–1953.** [Condition of the ionosphere at Rome, 1948–1953.] *Annali di Geofisica,* Rome, 7(4):503–520, Oct. **1954.** 7 figs. English and Italian summaries p. 520. **DLC**—Methods of ionospheric sounding by radio, used at the Ionospheric Station of the National Institute of Geophysics at Rome, are outlined and record illustrated. Normal monthly changes of the E, F1 and F2 layer, and the Sporadic E layer for Sept. 1948 to April 1953 are discussed and illustrated on graphs. Predictions based on critical frequencies of the F2 layer at Rome are also discussed. *Subject Headings:* **1. Ionospheric sounding 2. Ionospheric variations 3. Ionospheric forecasts 4. Rome.**—*M.R.*

11F–29 551.510.53

†Dominici, P. and Mariani, F., **Considerazioni critische sulla regione *F* della ionosfera.** [Comments on the F region of the ionosphere.] *Annali di Geofisica,* Rome, 8(1):103–120, Jan. **1955.** 2 figs., 3 tables, 55 refs. Italian and English summaries p. 117–119. **DLC**—The most important aspects of formation, behavior, and singularities in seasonal and diurnal structure of the F, F1 and F2 layers are reviewed and discussed qualitatively and quantitatively. The theory of thermal dilation is shown to be inadequate but the Martyn dynamo theory sufficient to account for anomalies under quiet conditions. The theory of formation of a zone of high density of electrons by superposition of F1 and F2 layers is reasonable but not quantitatively calculable. The possibility that the F layer is formed all at once by the same process involving relation of temperature/height characteristics to electronic density distributions is considered. Use of numerical methods not involving *a priori* models is considered the only method of solution of some of these problems. *Subject Headings:* **1. F layer 2. Dynamo-theory of ionosphere.**—*M.R.*

11F–30 551.510.535:523.164.4

Dougherty, J. P. (*Cavendish Lab., Cambridge, England*), **Magnetohydrodynamics of the small scale structure of the F region.** *Journal of Geophysical Research,* Wash., D. C., 64(12):2215–2216, Dec. **1959.** 8 refs., 2 eqs. **DLC**—The influence of the E region on Martyn's model for the explanation of radio-star scintillations and spread F is briefly discussed. *Subject Headings:* **1. Radio star scintillation 2. Spread F.**—*Author's abstract.* Ⓢ

11F–31 551.510.535:523.

Duncan, R. A. (*Univ. of Sydney*), **Lunar variations in the ionosphere.** *Australian Journal of Physics,* Melbourne, 9(1):112–132, March **1956.** 8 figs., table, 2 refs., 5 eqs. **DLC**—The global pattern of the observed lunar variations of the height and electron density of the F2 region is briefly summarized, new analyses being presented for Canberra (*fo*F2), Brisbane (*h'*F2), and Washington (*h'* and *fo*F2). It is concluded that the height variation has an amplitude of from 1 to 3 km and a phase giving maximum height at 06 lunar hours at moderate latitudes and at 09 lunar hours at the geomagnetic equator. The critical frequency variation has an amplitude of from 2 to 4%, maximum critical frequency occurring at about 09 lunar hours at moderate geomagnetic latitudes and 04 lunar hours at equatorial geomagnetic latitudes. A theory of lunar ionospheric variations is then presented. The current system which CHAPMAN has shown could be responsible for the observed lunar

eomagnetic field variations is taken as a starting point: it is considered that this current must flow t a height of about 100 km. The tidal winds needed to drive the current, the potential distribution hich will be set up in the dynamo layer, and the resulting periodic vertical drifts of ionization in the igher layers are calculated. It is shown that the divergence of drift velocity is too small to account or the lunar variation in *fo*F2. These are calculated taking into account the probable height ariations of recombination coefficient and ionization production rate. The conclusions thus eached are in good agreement with the observed variations in the F2. It is concluded that the mplitude of the lunar tidal wind near the E layer is about 45 times greater than that observed on the round. *Subject Headings:* **1. Lunar ionospheric variations 2. Lunar tides 3. F2 layer.**—*Author's bstract.*

11F–32 551.510.535:551.594.12

Dungey, J. W. (*A.W.R.E., Aldermaston Berkshire, England*), **Effect of a magnetic field on urbulence in an ionized gas.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2188–2191, Dec. 1959. fig., 24 eqs. **DLC**—The problem is formulated using the equations of motion for each onstituent of the gas. Approximations are discussed, and idealizations are adopted appropriate o the ionosphere. A physical picture is given for the generation of irregularities in electron density y shear flow in the neutral air. Given the motion of the air, the electron density can be calculated, nd this calculation is carried out in the linear approximation for an arbitrary Fourier component. *Subject Headings:* **1. Ionospheric electron density calculations 2. Turbulence in the ionosphere.**—*Author's abstract.* Ⓢ

11F–33 551.510.535:551.501.81(729.72)

Dyce, R. B.; Dolphin, L. T. et al. (*all, Stanford Res. Inst., Calif.*), **Aurora-like radar echoes bserved from 17° latitude.** *Journal of Geophysical Research*, Wash., D. C., 64(11):1815–1818, Nov. 1959. 2 figs., table, 8 refs. **DLC**—Anomalous echoes are regularly observed by a shipborne adar located at Antigua, British West Indies. These echoes, observed at 32 and 140 Mc/s, have many of the characteristics of echoes from the auroras observed in the Arctic, although visible auroras should not be observable at Antigua more frequently than once in 7 yrs. Similar observations at Stanford Univ. indicate a correlation with one kind of sporadic-E ionization. *Subject Headings:* **1. Radar echoes from sporadic E layer (Es) 2. Antigua, British West Indies. I. Leadabrand, R. L. II. Long, R. A.**—*Authors' abstract.* Ⓢ

11F–34 551.510.535:551.510.62:621.396.1

Echizenya, Yoshimatsu; Katano, Seizo and Ogata, Yoshiharu, **Characteristics of F2 layer multiple reflections (10–16 times).** *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(8):137–142, April 1955. 6 figs., table. **DWB**—It is often the case that F2 layer multiple reflections counting up to 10–16 times are noticed during observations on h'f. Scrutinizing the photographs taken at Akita Radio Wave Observatory for the past two years has revealed that there is a certain tendency that the time of appearance comes around with regularity. The appearance is limited to the nighttime and its seasonal variation has a close correlation with *fo*F2 at noon. However, there was generally a marked fall in the level of field intensity of the standard frequency 4 Mc/s between Tokyo and Akita during the period when such multiple reflections were observed. *Subject Headings:* **1. Ionospheric reflection 2. F2 layer.**—*Authors' abstract.*

11F–35 523.75:551.521.64:551.510.535

Ehmert, A. and Revellio, K. (*both, Max-Planck Inst. für Physik der Stratosphäre, Weissenau*), **Solare Ultrastrahlung und ionosphärische D-Schicht am 23. Februar 1956.** [Solar cosmic rays and the ionospheric D-layer on Feb. 23, 1956.] *Zeitschrift für Geophysik*, Würzburg, 23(3):113–134, 1957. 4 figs., 26 refs., eqs. **DLC** (QC801.Z4)—The outburst of solar cosmic rays at 23rd February 1956 caused a strong attenuation of longwave atmospherics on the night side of the earth. A discussion of our own and other records shows that the beginning follows immediately the first arrival of this solar radiation. The electron density caused by the ionization of these cosmic rays is sufficient to cause the observed attenuation. But this attenuation continued after the decrease of cosmic ray intensity for several hours. It is suggested that negative ions formed by attachment of electrons to O_2 have a long life at night in low concentration and that at every time a small fraction of them is liberated for a short time. These electrons continue attenuation. *Subject Headings:* **1. Solar flare, Feb. 23, 1956 2. Solar flare effects on cosmic rays 3. D layer.**—*Authors' abstract.*

11F–36 551.510.535:551.507.362.1

†Ellyett, C. D. (*U. Canterbury, Christchurch, New Zealand*) and Watts, J. M., **Stratification in the lower ionosphere.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 63(2):117–134, Sept./Oct. 1959. fig., 2 tables, 149 refs. **DWB, DLC**—A survey of the evidence for stratification in the ionosphere below 100 km is given, covering radio and optical observations, and rocket measure-

ments. The conclusion is reached that one stratum at about 85 km is observed consistently, and that other fine structure exists but has no long time constancy of height or pattern. There is no series of preferred heights below 100 km. The authors consider explanations which may account for the observations, and advocate the testing of radio methods of exploration in conjunction with rocket measurements in order to develop the most practicable means of obtaining accurate electron density versus height profiles on a synoptic basis. *Subject Headings:* **1. Ionospheric stratification 2. Rocket ionospheric measurements 3. Ionospheric electron density.**—*Authors' abstract.* Ⓢ

11F–37 551.510.535:551.501.7:621.396.8

Etzweiler, G. A. and Schmerling, E. R., **Measurements of the vertical incidence ionospheric absorption at 75 kc/s.** Pennsylvania. State Univ. Ionosphere Research, Contract AF 19(604)-1304 Scientific Report No. 109, Aug. 15, **1958.** 125 p. 4 figs., 8 refs., 5 eqs. (Appendix: 112 p. of tables.) **DWB** (M10.535 P415i)—The results of measurements of the absorption of radio waves at vertical incidence at a frequency of 75 kc/s are presented. The measuring techniques and equipments are described. The data are presented as diurnal plots of absorption for the period from 1 Oct 1955 through 25 April 1957 and as monthly means for the interval Oct. 1955 through April 1957. *Subject Heading:* **1. Ionospheric absorption.**—*Authors' abstract.*

11F–38 551.510.535:551.594.12:523.164.8

Evans, J. V. (*Jodrell Bank Experimental Station, Univ. of Manchester*), **The electron content of the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 11(3/4):259–271, **1957** 12 figs., 16 refs., 7 eqs. **DLC**—The investigation of the long period fading of radio echoes from the moon has provided a new technique for the measurement of the total electron content of the ionosphere (Browne et al., 1956). This method is based on the measurement of the rotation of the plane of polarization of the radio waves produced by the magneto-ionic effect in the earth's ionosphere. Some preliminary results (Evans, 1956) indicated that the total electron content is approximately twice that which would be expected on the basis of a simple parabolic layer from $p'f$ data. In this paper a brief account of the technique is given together with a description of the method of analyzing the records. The results of observations over a period of one year are then given. The technique is at present severely handicapped by the limited observing time imposed by the fixed (transit) aerial, and in consequence the results for some lunar months are poor. However, where good results have been obtained, the ratio between the observed electron content and that in the parabolic model has always been in the region of 2:1. There appears to be some evidence that the diurnal variation of the total ionospheric electron content is not completely regular, which is suggestive of tidal effects. *Subject Headings:* **1. Ionospheric electron density 2. Radio echoes from moon.**—*Author's abstract.*

11F–39 551.510.535:550.388.2

Eyfrig, Rudolf; Harnischmacher, Ewald and Rawer, Karl, **Informations obtenues à l'aide des cartes d'ionisation.** [Information deduced from ionization charts.] *Académie des Sciences, Paris Comptes Rendus*, 240(4):446–448, Jan. 24, **1955.** 4 refs. **DWB**—The geomagnetic control of the F2 layer is only effective during the daylight hours, but it is so up to very high latitudes. A few details are given concerning the diurnal variation and latitudinal distribution. The "auroral E" layer is also discussed. *Subject Headings:* **1. F2 distribution 2. Geomagnetic effects on ionosphere.**—*Transl. of authors' abstract.*

11F–40 537.2:551.510.535:550.381.

Farley, D. T., Jr. (*Cornell Univ., Ithaca, N. Y.*), **A theory of electrostatic fields in a horizontally stratified ionosphere subject to a vertical magnetic field.** *Journal of Geophysical Research*, Wash. D. C., 64(9):1225–1233, Sept. **1959.** 5 figs., 9 refs., 18 eqs. **DLC**—A theory is developed to describe quantitatively the idea that in an ionized gas subject to an imposed magnetic field, such as the ionosphere, the lines of magnetic flux are approximately equipotential lines. The ionosphere is assumed to be horizontally stratified, and the case in which the earth's magnetic field is vertical is considered. Small-scale electrostatic fields are studied with a view toward elucidating the phenomena of spread F and radio star scintillation. The analysis indicates that in the ionosphere the results are strongly affected by the variation of conductivity with height, as well as by the anisotropy. For a reasonable model of the ionosphere it is shown that it is possible, under certain conditions, for a horizontal field three kilometers or larger in extent, at a height of about 120 or more kilometers to produce a similar, localized electric field in the F region, not appreciably reduced in strength. The height of the source is the most important factor, but the temperature and ionization-density profiles are also significant. The fact that the strength of the small-scale fields in the F region could vary by one or two powers of 10 for plausible diurnal variations of the ionospheric parameters suggests that these fields could perhaps be responsible for the puzzling diurnal behavior of spread F and

dio star scintillation. *Subject Headings:* **1. Electrostatics 2. Diurnal ionospheric variations Vertical magnetic field.**—*Author's abstract.* Ⓢ

11F–41 551.510.535:551.594.13

Fejer, J. A. (*Telecom. Research Lab., Johannesburg, S. Africa*), **Semidiurnal currents and electron rifts in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(4/5):184–203, 953. 10 figs., 26 refs., 32+ eqs. **DWB**—The differential equations of the dynamo theory for rrestrial ionosphere are solved numerically under simplifying assumptions. The calculated current nsities are used to estimate tidal velocities in the ionosphere necessary to produce the quiet day agnetic variations. A tidal amplification of about 60 compared with velocities on the ground is lculated. The calculated velocities and phases of vertical electron drifts are in reasonable agree- ent with experimental determinations of lunar tidal variations in measured virtual height of the fferent ionospheric layers. The calculated velocities and phases of horizontal electron drifts fit bservations on long duration meteor echoes but the calculated phases are opposed to those obtained om fading measurements. The fading measurements appear therefore to refer to air movements id not to electron drifts. *Subject Headings:* **1. Dynamo-theory of ionosphere 2. Ionospheric irrents 3. Ionospheric electron drift.**—*Author's abstract.*

11F–42 551.510.535:551.594.13

Fejer, J. A. and Vice, R. W. (*both, Nat. Inst. for Telecommunications Res., Johannesburg, S. frica*), **An investigation of the ionospheric D-region.** *Journal of Atmospheric and Terrestrial hysics*, N. Y., 16(3/4):291–306, Nov. **1959.** 11 figs., 8 refs. **DWB, DLC**—Two previously de- cribed methods of ionospheric investigation, the observation of weak echoes from the D region (Gardner and Pawsey, 1953) and the measurement of ionospheric wave interaction (Fejer, 1955), re used to determine tentative profiles of electron density and collision frequency for the ionosphere elow about 85 km. *Subject Headings:* **1. D layer 2. Ionospheric electron density 3. Collisional requencies in ionosphere.**—*Authors' abstract.* Ⓢ

11F–43 551.510.535:551.557

Fejer, J. A. (*Defense Res. Telecommunications Establishment, Ottawa, Canada*), **Electrodynamic tability of a vertically drifting ionospheric layer.** *Journal of Geophysical Research*, Wash., D. C., 4(12):2217–2218, Dec. **1959.** fig., 2 refs., 8 eqs. **DLC**—The electrodynamic stability of a vertically rifting ionospheric layer is examined under certain simplifying assumptions. No evidence of nstability is found. *Subject Headings:* **1. Ionospheric drift 2. Ionospheric vertical currents.**—*Author's abstract.* Ⓢ

11F–44 551.510.535:551.594.1/2

Florian, Endre, **A légkör elektromos tulajdonságai, adatai és hazai mérésük.** [Characteristics f atmospheric electricity and their measurement in Hungary.] *Időjárás*, Budapest, 59(1):24–41, an./Feb. **1955. DLC**—Referring to the recent purchase of ionospheric sounding equipment by the Hungarian Meteorological Institute, the author gives a concise review of ionospheric research. He liscusses (1) the structure of the ionosphere, (2) ion densities, (3) variations of ionospheric height nd density, (4) applications of ionospheric data in astronomy, geophysics, radio propagation and meteorology, and (5) ionospheric measurement methods and instruments. Experimental iono- spheric equipment was installed at the Institute in Jan. 1954. Regular measurements are now eing made of E, F1 and F2-layer height and F2 critical frequency. The data are published every 10 days. Tropospheric electricity (which has been measured in Hungary for 40 yrs) is also briefly liscussed. *Subject Headings:* **1. Ionospheric research 2. Ion density 3. Ionospheric soundings 4. Atmospheric electricity 5. Hungary.**—*G.T.*

11F–45 551.510.535:551.594.13

Gallet, R. M. and Helliwell, R. A., **Origin of "very-low-frequency emissions."** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 63(1):21–27, July/Aug. **1959.** 4 figs., 2 tables, 14 refs., 9 eqs. **DLC, DWB**—Selective traveling-wave amplification in the outer ionosphere is postulated to explain very-low-frequency emissions, a class of very low-frequency (1 to 30 kilocycles per sec.) natural noise. By analogy with the mechanism of traveling wave tubes, low-level ambient noise in the outer ionosphere is amplified in streams of incoming ionized solar particles at frequencies for which the stream and wave velocities are equal. Required velocities are in the range 0.01 to 0.1 c (where c is the velocity of light). Streams with densities of the order of one electron per cubic centimeter would provide sufficient energy. Phenomena which can be explained qualitatively by the theory are the hiss, quasi-constant tones, dawn chorus and related transients, and very long trains of whistler echoes. A quantitative example shows how the theory can reproduce the general form of certain characteristic discrete spectra "hooks" of emissions, and how this leads to definite values

of particle velocity and a law for the distribution of electron density in the outer ionosphere. *Subject Headings:* **1. Ionospheric VLF propagation 2. Ionospheric electron density 3. Whistler frequencies**—*Authors' abstract.* Ⓢ

11F–46 551.510.535:551.55

Gerson, N. C. (*AF Cambridge Res. Lab., Base Dir. for Geophy. Res., Cambridge, Mass.*), **Sporadic E movements.** *Geofisica Pura e Applicata*, 18:162–169, **1950.** 18 figs. **DLC**—Abnormal (sporadic) E activity observed on June 13–14, 1949 by a cooperative network of radio amateurs in the U. S. is discussed and the movements shown on charts made at hourly intervals from 2300 to 0600Z. A summary sketch shows the general motions from E or SE of 3 main areas of Es, scattered from New England and the Great Lakes to the Gulf of Mexico. No observations were obtainable from north of 50°N or from ocean areas. Data obtained by oblique incidence calculations based on 2 operator fixes during communication, are plotted as points on each chart. *Subject Headings:* **1. Sporadic E movements 2. Ionospheric winds.**—*M.R.*

11F–47 551.510.53

Gerson, N. C. (*AVCO Mfg. Corp. Boston, Mass.*), **Latitude effects in sporadic E observations.** *AGARDograph*, Paris, No. 34:81–96, Sept. **1958.** 11 figs. **DWB** (629.1323 N864a)—During the period 1949–1951, North American radio amateurs participated in a cooperative study of abnormal propagation conditions in the VHF band. About 350 amateurs were involved, mainly from the U. S. and Canada, but also from Mexico and Central America. The study was made at a radio frequency of 50 Mc/s with some observations also obtained at 144 Mc/s. Reports were prepared by the amateurs whenever they contacted or received another transmitter operating in this frequency range, because of unusual propagation effects. The reports provided such factors as the terminal points of the propagation path, the time, signal strength, character of the signal, and so on. Several conclusions have been drawn regarding the geographical distribution of sporadic E but, to determine the long-term Es climatology, additional observations over many years are necessary. *Subject Heading:* **1. Sporadic E layer (Es) latitude distribution.**—*Author's abstract.*

11F–48 551.510.535:537.56:551.594.11

Ghosh, S. N. (*U. S. A. F. Cambridge Research Center, Boston*), **Charge transfer in the upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 61(2, Pt. 1):193–200, June **1956.** 3 tables, 9 refs., 6 eqs. **DLC**—In this paper, charge transfer reactions which remove the identity of ions are discussed in detail in terms of their value to upper atmospheric research. For reactions involving Ca^+ ions, it is found that the energy defects are large, but for H^+ the defects are generally small, so that when these latter ions have practically lost all their energy the reactions are most probable to occur. As in the case of protons, Ca^+ ions, in collision with atmospheric gases, are expected to excite certain Ca lines and also certain lines and bands of atmospheric gases. It is shown that by means of the charge transfer reactions it is possible to derive both the ratio of the density of O^+ to the O_2^+ ions and the effective recombination coefficient for the F layer. However, for nearly all other reactions, it is found that the low energy ions present in the ionized layers of the atmosphere have low cross-sections. *Subject Headings:* **1. Ion recombination theory 2. Ion variations 3. F layer ionization.**—*Author's abstract.*

11F–49 551.510.535:551.594.13

Gibbons, J. J. and Wolf, J. D., **Methods of determining long wave reflection coefficients for a specific ionospheric model.** Pennsylvania. State Univ. Ionosphere Research Laboratory Scientific Report, No. 75, Contract AF 19(604)-1304, June 1, **1955.** 50 p. 13 figs., table, 6 refs. 54 eqs. **DWB**—The purpose of this report is twofold. The first objective is to test the applicability of an iterative process due to V. A. Bailey to the problem of computing the 75 kc/s ionospheric reflection coefficient by a specific model. The details of two applications using different first approximations are presented. The second part deals with the computation, by numerical integration, of the 75 kc/s reflection coefficient for the same ionospheric model. A comparison is then made of the values obtained from the iterative process and those obtained by numerical integration, and the results discussed. The detailed results of the numerical integration are tabulated in the Appendix. *Subject Headings:* **1. Ionospheric reflection coefficients 2. Ionospheric models 3. Long wave reflection.**—*Authors' abstract.*

11F–50 550.384:551.594.13:551.510.535

Giorgi, M. and Molina, F., **La variazione "Sq" all'Osservatorio di Gibilmanna.** [Variation of "Sq" at the Gibilmanna Observatory.] *Annali di Geofisica*, Rome, 9(1):17–30, Jan. **1956.** 7 figs. 3 tables, 9 refs. English summary p. 29. **DLC**—Sq curves of the Gibilmanna Observatory for the three components H, D, and Z, and for the three Lloyd's seasons are given. The curves, corrected for the non cyclic variation, refer to the period 1954–55. All results are interpreted and discussed

ith reference to the form and displacements of the ionospheric current system responsible for the q variation. *Subject Headings:* **1. Geomagnetic variations 2. Ionospheric currents.**—*From uthors' abstract.*

11F–51 551.510.535:551.594.12

Goldberg, P. A. (*Geophysics Lab., Boeing Scientific Res. Labs., Seattle*), **Some aspects of the lectrical properties of the upper atmosphere.** *American Astronautical Society, Proceedings*, 1958, ssued **1959.** p. 37–50. 8 figs., 3 tables, 14 refs., eqs. **DWB** (629.1388), **DLC** (QB1.A27)—Basic roperties of the D-region (150,000 to 300,000 ft. altitude) are summarized in a table and 7 graphs ith decade (min.-max.) ranges of electrical conductivity (σ), dielectric constant (ϵ_r), index of efraction (n), local attenuation factor (a'), horizontal attenuation (ah) and vertical attenuation actor (du) and penetration depth for 100 c/s to 100 Mc/s given. Basic theory and practical pe- uliarities of this region and of the variables are discussed. *Subject Headings:* **1. Electrical properties f D-region 2. Ionospheric D-region.**—*M.R.* Ⓢ

11F–52 551.551.5:551.510.535:550.385

Golitsyn, G. S. (*Academy of Sciences, Moscow*), **On the influence of the magnetic field on the haracter of turbulence in the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12): 212–2214, Dec. **1959.** table, 4 refs., 11 eqs. **DLC**—The influence of the earth's magnetic field n the character of turbulence in the ionosphere is considered on the basis of the equations of magneto- ydrodynamics. The estimates given show that its influence in the lower ionosphere up to heights f 150 to 200 km can be neglected. At heights greater than 200 km the influence of the earth's agnetic field must be considered in the dynamics of the medium. The fact that the gases are ighly rarefied constitutes an additional problem in formulating a theory of turbulence for the upper egions of the ionosphere. It is shown here that the ratio of Kolmogorov's inner scale of turbulence o the mean free path of neutral molecules decreases with the decrease in number of particles n and n^2 eaching the value of the order 30 or less at the height of 250 km. Therefore, the theory of turbulent notions at such heights should not entirely neglect the molecular structure of the medium. *Subject Headings:* **1. Turbulence in the ionosphere 2. Magnetic effects on ionosphere.**—*Author's abstract.* Ⓢ

11F–53 551.510.535:551.551.5:621.396.1

+Hagfors, Tor (*Norwegian Defence Res. Estab.*), **Investigation of the scattering of radio waves at metric wavelengths in the lower ionosphere.** *Geofysiske Publikasjoner*, Oslo, 21(2), Aug. **1959.** 58 p. 6+ figs., 6+ tables, 41 refs., 6+ eqs. **DWB, DLC**—An outline is given of the experimental and theoretical knowledge on the scattering of metric waves in the lower ionosphere as observed over an oblique path. It is shown that there still is considerable disagreement on the question of the mode of propagation involved. Some workers ascribe most of the signal to reflection from meteor trails. Others believe in various types of scattering from electronic irregularities due to turbulence, and yet others maintain that partial reflections from gradients in mean electron density may explain the signal. The partial reflection theory is discarded as very improbable for theoretical reasons. The application of radio interferometer technique is then shown to be well suited for deciding whether turbulent scattering or meteor trail reflection is the dominant mechanism. This technique is applied to an 1180 km test circuit at 46.8 Mc/s, and it is shown that turbulent scattering is dominant in the continuous signal, but that a fraction of the continuous signal power is due to meteor reflections. The spatial power spectrum of electronic irregularities at a height of about 85 km is shown to follow approximately an inverse power law in the wave number k of the form k^{-9}. For the neutral gas this implies that wave number $k < 0.35\ m^{-1}$, is probably within the "dissipation range" of the similarity region of the velocity spectrum of homogeneous turbulence. The typical r.m.s. turbulent velocity encountered is about 10 Mc/s, and the turbulence is approximately isotropic. *Subject Headings:* **1. Ionospheric radio wave scattering 2. Turbulence effects on radio waves 3. Radio wave propagation by meteor ionization.**—*Author's abstract.* Ⓢ

11F–54 551.510.535:523.746

Herrinck, P. (*Section de Géophysique, Service Météorologique, Léopoldville, Congo Belge*), **Prediction of sunspot numbers until the end of the present cycle.** *Nature*, London, 184(4679):51–52, July 4, **1959.** table, 2 refs., 2 eqs. **DWB**—Much successful use has been made of the elementary long-term ionospheric prediction method for sunspot numbers since Nov. 1956. An analysis of previous records indicates a striking coincidence of sunspot numbers during two periods 1749–85 and 1918–54. This fact has led to an empirical prediction of a possible existence of a 169 year period of solar activity. With a new mathematical approach a table of the monthly sunspot numbers during the years 1957–1966 has been made. From Nov. 1966 the numbers are negative. Without theoretical support, the author feels that nothing better could be expected for such long-term prediction. *Subject Heading:* **1. Ionospheric forecasts.**—*N.N.* Ⓢ

11F–55 551.507.362.2:551.510.535:621.396(

Hibberd, F. H. (*Univ. New England, Armidale, N. S. W. Australia*), **The Faraday fading radio waves from an artificial satellite.** *Journal of Geophysical Research*, Wash., D. C., 64(8):945-948, Aug. **1959.** fig., 5 refs., 7 eqs. **DLC**—Faraday fading of signals from an artificial satellite analyzed in terms of the difference between the Doppler shifts of the ordinary and extraordinar components in the ionosphere. A procedure is outlined for determining the vertical distributio of electron density in the upper ionosphere. Explanations are given for the apparently excessiv values of electron content yielded by measurements of Faraday fading and for the observation tha the rate of Faraday fading is not exactly inversely proportional to the square of the wave frequenc *Subject Headings:* **1. Satellite ionospheric observations 2. Radio fading.**—*Author's abstract.* Ⓢ

11F–56 551.510.535:551.541:551.55

Hines, C. O. (*Defence Res. Board, Ottawa, Canada*), **An interpretation of certain ionospher motions in terms of atmospheric waves.** *Journal of Geophysical Research*, Wash., D. C., 64(12) 2210-2211, Dec. **1959.** 5 refs., 2 eqs. **DLC**—Internal atmospheric waves, subject to gravitation and compressional forces, have characteristics in close accord with measurements of ionospher motions revealed by meteor trails. They are also consistent with other types of observation evidence on movement in the ionosphere. Many of the observations may therefore find the proper interpretation in terms of these waves. *Subject Headings:* **1. Ionospheric movements 2. A mospheric waves.**—*Author's abstract.* Ⓢ

11F–57 551.510.535:621.396.6:535.41

Houston, Robert E., Jr., **75 Kc/s in phase height instrumentation and data.** Pennsylvani State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report, No. 93, May **1957.** 68 p. 34 figs., table, 14 refs. **DWB** (M10.535 P415i)—The instrumentation utilized i measuring changes in phase of a pulsed radio signal, whose carrier frequency is 75 kc/s and is verticall incident on the lower ionosphere, is described. The various components in the equipment ar discussed in some detail. Block and schematic diagrams and photographs are included. It pointed out that the entire apparatus acts as a radio interferometer and recorder. Illustrations the various types of records obtained are shown, and the method of reducing them to monthl averages is indicated. Where enough daily records were available, the monthly average of the chang in phase height of the main E layer reflection is given. It is concluded that the operation of th equipment is satisfactory. The received signals are phase stable and resolved sufficiently to b measured. A recommendation for the study of anomalous events in the ionosphere is made. *Subje Headings:* **1. Pulsed radio signal measurement 2. Radio interferometers.**—*Author's abstract.*

11F–58 551.594.12:551.510.535:551.551

Howells, I. D. (*Cavendish Lab., Cambridge, Eng.*), **On the spectrum of electron density produce by turbulence in the ionosphere in the presence of a magnetic field.** *Journal of Geophysical R search*, Wash., D. C., 64(12):2198–2199, Dec. **1959.** ref., 5 eqs. **DLC**—The work described in th paper starts from Dungey's results, and obtains approximate equations for number density ionization, under the action of turbulence, diffusion, and a magnetic field, in various limiting case The principal result is that this mechanism cannot be expected to produce irregularities that a strongly elongated along the magnetic field. A form is obtained for the spectrum function of numb density below 140 km. *Subject Headings:* **1. Electron density spectra 2. Turbulence in ionosphere** —*Author's abstract.* Ⓢ

11F–59 551.510.535(08

International Symposium on Fluid Mechanics in the Ionosphere, Ithaca, N. Y., July 9–15, 195 **Transactions** (ed. by R. Bolgiano, Jr.) issued in *Journal of Geophysical Research*, Wash., D. C 64(12):2037–2231, Dec. **1959.** Includes 27 papers (two summaries only). Introductory review b R. Bolgiano, Jr. (Organizing secretary) includes list of participants, and the principal conclusions the symposium. For listing of the papers, *see* Pt. III, 11(2), Feb. 1960, *MAB*. These pape abstracted separately. **DLC**—Symposium was sponsored by International Scientific Radio Unio the International Union of Theoretical and Applied Mechanics, and the International Union Geodesy and Geophysics. **DLC**—*Subject Headings:* **1. Ionospheric symposia 2. Turbulence in ionosphere. I. Bolgiano, R., Jr.,** (*ed.*) **II. International Scientific Radio Union III. International Unio of Theoretical and Applied Mechanics IV. International Union of Geodesy and Geophysics.** Ⓢ

11F–60 551.510.535:551.507.36

Istomin, V. G., **Issledovaniia ionnogo sostava atmosfery Zemli na raketakh i sputnikakh.** [In vestigations of the ion composition of the earth's atmosphere by rockets and satellites.] *Iskusstven nye Sputniki Zemli*, Moscow, No. 2:32–35, **1958.** fig., 3 refs. **DLC.** Transl. into English issued i

ificial Earth Satellites, issued N. Y., Plenum Press; London, Chapman & Hall, **1960.** Vol. 2:40–
—The construction and use of the 5.7 cycle variant of the radio frequency mass spectrograph of
net for measuring the ionic composition of the atmosphere are described. Its range is 6–50
mic units of mass; the time of measurement for this range is 1.7 sec. The resolution in the region
nass number $M = 28$ is equal to $R = M/\Delta M \approx 28$, where ΔM = width of the peak measured at its base
atomic units of mass. The tube can be taken apart and is of metal-glass construction. The radio
quency analyzer is joined to the ionic source by means of vacuum condensation to a copper gasket.
e calibration characteristics were made on the basis of five points on the mass scale: A^{40}, A^{36}, N^{544},
^{22} and Ne^{21}. The first vertical ascent was made with a rocket in Sept. 1957 and the results are pre-
ted in a graph. The results showed that ions with mass number 20 predominated at 105–206 km.
as with other mass numbers were present at 105–190 km in an amount not exceeding 20% of the
ximum concentrations of ions with mass number 30. Ions with mass number 16 (atomic oxygen)
re recorded only from 192 to 206 km. The results of measurements carried out with the third
ificial earth satellite indicated the following, viz: ions with mass number 16 (O^+) predominated at
ghts above 250 km; these ions were recorded between 230 and 885 km. The second constituent
s ions of mass number 14 (N^+). In addition to the peaks corresponding to O^+ and N^+, there were
ained peaks corresponding to ions of mass 18 (H^2O^+). *Subject Headings:* **1. Ion composition of
per atmosphere 2. Satellite ionospheric observations 3. Rocket ionospheric observations.**
T.L.D.

11F–61 551.510.535:551.507.362.1:621.396.6

Jackson, S. E. and Kane, J. A. (*both U. S. Naval Res. Lab., Wash., D. C.*), **Measurement of
ospheric electron densities using an RF probe technique.** *Journal of Geophysical Research*,
ash., D. C., 64(8):1074–1075, Aug. **1959.** fig., 4 refs. **DLC**—A rocket-borne transmitting antenna
s used to measure ionospheric electron densities. It consists of two whips, each 14 ft long forming
electrically short dipole at 7.75 Mc, with a free-space impedance of $Z = (5.0 - j538)$ ohms. On the
sis of the encouraging results a program is now under way to develop a reliable RF probe for
asuring electron densities. *Subject Headings:* **1. Rocket antennas 2. Ionospheric electron density
easurement techniques.**—*E.K.* Ⓢ

11F–62 551.510.535:551.510.62:621.396.1

Kasuya, Isao, **Some considerations on measurement of bearings of the incoming short waves,
1. *Japan. Radio Research Laboratories, Tokyo, Journal*, 1(5):27–40, June **1954. Pt. 2,** *Ibid*,
7):77–83, Jan. **1955.** figs., refs. Pt. 2 also issued in *Japan. Science Council. Ionosphere
search Committee, Report of Ionosphere Research in Japan*, 9(1):45–50, March **1955.** figs. **DWB**—
Pt. 1, the author discusses the relationship between the arrival bearings of short waves and the
ndition of ionospheric propagation in the calm period. In Pt. 2, it is suggested that the same
nsiderations as in Pt. 1 may also be applied to an interpretation of the lateral deviation of arrival
arings of short waves in the disturbed period, i.e., the lateral deviation in the disturbed period
ay be interpreted in terms of the irregular reflection of the waves by abnormally tilted ionosphere.
bject Headings: **1. Ionospheric radio wave propagation 2. Ionospheric radio wave reflection.**—
uthor's abstract.

11F–63 523.74:551.510.535

Kasuya, Isao and Sawada, Kazuyoshi, **Comparison of *fo*F2 at four observatories in Japan.**
pan. Radio Research Laboratories, Journal, 3(11):45–53, Jan. **1956.** 8 figs., 3 tables. **DWB**—
om the results of ionospheric observations carried out at Wakkanai, Akita (Fukaura), Kokubunji
okyo) and Yamagawa during the years 1947 to 1954 in a half cycle of solar activity, the values
*fo*F2 obtained by the four observatories are compared and the differences in value between Koku-
nji and the other three places are obtained quantitatively. The results show that the secular
riations rank in latitudinal order but the latitudinal effect on seasonal variations is not con-
icuous, for there are some points out of order between Akita and Wakkanai and it is supposed
at there may be turning-points in variation in the vicinity of Akita. *Subject Headings:* **1. *fo*F2
mparisons 2. Solar activity 3. Japan.**—*Authors' abstract.*

11F–64 551.510.535:550.385.43

Kato, Yoshio and Watanabe, Tomiya (*both, Geophysical Inst., Tohoku Univ., Sendai*), **Studies on
S.C. (Polar sudden commencements).** *Japan. Science Council. Ionosphere Research Com-
ittee, Report of Ionosphere Research in Japan*, 10(2):69–80, **1956.** 6 figs., 2 tables, 18 refs., 10 eqs.
WB—Facts obtained from observations of p.s.c. suggest that its origin is outside the ionosphere.
rticularly, the daily behavior of the horizontal perturbing vector of p.s.c. can be explained by the
ielding effect of the non-uniform ionosphere. *Subject Heading:* **1. Polar sudden commencements.**
Authors' abstract.

11F–65 551.510.53

Kay, I., **On the measurement of virtual height.** N. Y. Univ. Institute of Mathematic Sciences. Div. of Electromagnetic Research, Contract DA-49-170-Sc-2253, Research Repo MME-5, July **1957.** 11 p. 3 refs., eqs. **DWB** (538 N532r)—A time dependent definition virtual height of a reflected wave train is given so that its accuracy increases as the width of t incident pulse increases. An example is given of a reflected wave whose virtual height cannot b determined by inspection, but which can be determined correctly from the given expression. *Subje Heading:* **1. Virtual height calculations.**—*From author's abstract.*

11F–66 551.510.535:551.594.12:621.396.

Kelso, J. M. (*Space Technology Lab., Inc., L. A., Calif.*), **The determination of the electro density in interplanetary space.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):357 359, Nov. **1959.** 3 refs., 4 eqs. **DWB, DLC**—A very high frequency pulse transmitted from th earth to a space vehicle at interplanetary distances will be subject to a delay exceeding that in fre space by an amount proportional to the average electron density along the path. It is show that this average electron density and the arc length of the ray path can be measured by transmittin a pulse to the vehicle on one frequency and transponding pulses from the vehicle on two frequencies With sufficiently accurate measurements, the total electron content along the ray path through th ionosphere can be determined from such an experiment conducted from a high-altitude satellit *Subject Headings:* **1. Ionospheric electron density calculations 2. Ionospheric VLF propagation.**— *Author's abstract.* Ⓢ

11F–67 551.510.53

†King, G. A. M. (*Geophysical Observatory, Christchurch, New Zealand*), **Relation between virtua and actual heights in the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, Londo 11(3/4):209–222, **1957.** 4 figs., 2 tables, 37 refs., 29 eqs. **DLC**—There are two general methods c deducing the "true" heights from the virtual height-frequency curve. Aspects of the compariso method treated are choice of model, effect of the earth's magnetic field, the meaning of total electro content, and the use of hp and M3000 as height indicators. The integral method is discussed fro the viewpoints of the derived curve and the step-by-step procedure. There is a brief treatment o the nominal accuracy of reduction, sections on the importance of the earth's magnetic field and o "valleys" between layers, and a discussion of factors affecting the actual accuracy of analysis There are five current research projects at Christchurch based on true height analysis. The bibliog raphy is divided up according to subject, and there are notes on the references. *Subject Headings* **1. Ionospheric height determination 2. Virtual height calculations.**—*Author's abstract.*

11F–68 551.510.535(99

Knecht, R. W. (*Nat'l. Bur. Standards, Boulder, Colo.*), **Observations of the ionosphere over th south geographic pole.** *Journal of Geophysical Research*, Wash., D. C., 64(9):1243–1250, Sept **1959.** 5 figs., 3 tables, 4 refs. **DLC**—Monthly median values of penetration frequencies of th ionosphere over the south geographic pole have been examined. Twenty months of data (June 195 through Jan. 1959) are included in the study of *fo*F2, while *fo*E and *fo*F1 median values are show for 6 summer months (Nov. and Dec., 1957; Jan., Nov., and Dec. 1958; Jan. 1959). It is found that F region ionization persists throughout the 6-month winter night. Marked diurnal variation are observed in the monthly medians of *fo*F2 even though the usual daily variation in solar elevatio is absent at this unique location. A small but significant diurnal variation is also found in *fo*F1 In contrast, *fo*E exhibits no regular daily fluctuation, but seems to depend to a great extent on th level of solar activity. *Subject Headings:* **1. Ionospheric variations 2. Antarctic ionosphere 3. Ant arctica.**—*Author's abstract.* Ⓢ

11F–69 551.510.535:551.594.1

Kundu, M. R., **Velocity of movement of sporadic E clouds.** *Calcutta. Univ. Institute of Radi Physics, Research Report*, 7:23–25, 1954/1955, pub. **1955.** fig., 2 refs. **DWB.** Also in *Science an Culture*, Calcutta, 20(6):303, Dec. **1954.**—The height distribution of ionization in the composit F region is calculated on the assumptions that the scale height (i.e., the temperature) increases an the recombination coefficient decreases with height in this region. The recombination coefficien is assumed to vary in terms of the reduced height, that is, the height (above F_1max) measured i terms of the scale height and not in terms of the actual height as had been done earlier by A. P. MITR in making similar calculations. The present assumption automatically takes into account the effe of rising temperature on the value of the recombination coefficient. Height distribution curves fo high and low latitude stations are drawn for typical summer and winter conditions in the hig atmosphere in the F region. It is found that when the possible effects of ionospheric tidal drifts ar taken into account, the forms of the distribution curves, as also the separation between the F1 an F2-layers, agree with those deduced from observational data. The investigation lends support t

the hypothesis that the ionospheric regions F1 and F2 belong to a common bank of ionization produced by a common ionizing radiation from the sun. *Subject Headings:* **1. Sporadic E clouds 2. Recombination coefficients 3. F layer ionization distribution.**—*Author's abstract.*

11F–70 551.510.535:621.396:551.507.362

Krasovskiĭ, V. I., **Sovetskie issledovaniia ionosfery pri pomoshchi raket i iskusstvennykh sputnikov Zemli.** [Soviet exploration of the ionosphere by rockets and artificial earth satellites.] *Iskusstvennye Sputniki Zemli*, Moscow, No. 2:36–49, **1958.** 15 figs., 16 refs., 4 eqs. **DLC.** Transl. into English issued in Artificial Earth Satellites, issued N. Y., Plenum Press; London, Chapman & Hall, **1960.** Vol. 2:45–62.—A review of the principal studies in the ionosphere by means of rockets and artificial earth satellites carried out in the U.S.S.R. The methods for making these studies involved the use of the disperse interferometer which measured the radio waves radiated from the rocket and the satellite, the direct measurement of the concentration of charged particles in the ionosphere, and the transmission of the reading by telemetric systems. The apparatus are described with the aid of diagrams and photographs and the results of individual rocket and satellite ascents are presented in graphs. The ionization above the maximum of the F2 layer declines very slowly with height so that the altitude scale for ionizing particles is very large; at 475 km an ionization of about 10^6 electrons mets/cm^3 was recorded on Feb. 21, 1958; at 795 km the concentration of positive ions reached 1.9×10^5 ion/cm^3 on May 15, 1958. The effective temperature of electrons in the F region and above was higher than the temperature of the environment. The ionosphere below the maximum of the F region, in contrast to its model, constructed on the basis of ionospheric probing from the earth, does not have sharply demarcated layers but is characterized by a small maxima with monatomic increase in electron density up to the maximum of the F2 layer. The maximum of the F2 layer, and in general the ionization below this region, is 50–150 km below the values of the usual ionospheric probing from the earth. The equations for computing the mean electron density at a given elevation, the current of the collector in the direct determination of ion concentration, and the deceleration potential are presented in appendices. *Subject Headings:* **1. Ionospheric height measurements 2. Ionospheric electron density 3. Soviet satellite investigations 4. Satellite ionospheric observations.**—*I.L.D.*

11F–71 551.510.535:551.590.24

*Landmark, B.; Lied, F.; Orhaug, T., and Skribeland, S., **Ionospheric observations during the solar eclipse of June 30th 1954.** *Geofysiske Publikasjoner*, Oslo, 19(8), **1956.** 39 p. 22 figs., 2+ tables, 3 refs., eqs. **DLC**—This monograph consists of 3 parts: Pt. I, by Landmark, Lied and Skribeland, discusses and presents data on h'f observations obtained during the eclipse of June 30, 1954 at the 3 NDRE stations. It is shown that the F2 layer observations at time of total eclipse can only be explained by a definite solar control over the ionizing agency. Recombination coefficients have been worked out for the E, F1 and F2 layers. Pt. II, by Lied and Orhaug, on F1 layer ionospheric absorption during the eclipse is based on observations at Kjeller and Tromøya, especially those made with variable frequency equipment, gave a basis for a solar "model." Pt. III, by Lied, on "an ionospheric layer during a solar eclipse" shows electron density profiles and other characteristics of an eclipse ionospheric layer. *Subject Headings:* **1. Eclipse ionospheric layer 2. Eclipse effects on ionosphere.**—*M.R.*

11F–72 551.510.535:551.521.67

Lange, Heinz (*German Acad. of Sci. Berlin*), **Über Korpuskulastörungen der F2-Schicht und die Südwärtsbewegung des Störungseinsatzes auf der Nordhalbkugel der Erde.** [Concerning corpuscular disturbances of the F2 layer and the southward movement of the onset of the disturbances in the Northern Hemisphere.] *Beiträge zur Geophysik*, Leipzig, 68(4):230–245, **1959.** 5 figs., 4 tables, 10 refs., eqs. German and English summaries p. 230. **DWB, DLC**—The existing theories of the solar corpuscular radiation and the ionospheric disturbances dependent on it are briefly described. The times of beginning of the disturbances are investigated to the following questions: 1. Can the southward movement be shown in the region considered? 2. What is the velocity of propagation of the disturbances? 3. What shape have the lines of simultaneous beginning of the disturbances? It is shown that the southward movement is real, its velocity is about 500 km/h, and the propagation is not concentric to the fictive magnetic pole of the Earth. *Subject Headings:* **1. Ionospheric disturbances 2. Solar corpuscular influence on upper atmosphere.**—*Author's summary.* Ⓢ

11F–73 551.510.535:551.594.12

†Lauter, Ernst August, **Die Struktur der tiefen Ionosphäre und ihre Variationen.** [The structure of the lower ionosphere and its variations.] *Germany. Deutscher Wetterdienst, Berichte*, 4(22):55–64, **1956.** 15 figs., 46 refs. **DWB, DLC**—A comprehensive review of existing knowledge on the structure of the lower ionosphere, the normal variations in the ionization of the lower ionosphere including diurnal and annual variations, effects of sunrise and interdiurnal variations; the expression

of solar eruptions in the lower ionosphere; the expression of corpuscular irruptions in the upp atmosphere; the sporadic E layer; drift motions in the ionosphere; and interrelationships betwe ionosphere and stratosphere. *Subject Headings:* **1. Ionospheric structure 2. Ionospheric ionizati 3. Ionospheric variations.**—*I.L.D.*

11F–74 551.510.535:551.593.12:523.164

Lawrence, Robert S. and Jespersen, James L., **A preliminary analysis of amplitude scintillatio of radio stars observed at Boulder, Colorado.** *U. S. National Bureau of Standards, Technical No* No. 20, July **1959.** 19 p. 9 figs., tables, 20 refs., 17 eqs. **DWB** (M(055) U585te)—Variations in t apparent flux from the radio source Cygnus-A are recorded at 53 and 108 mc/s using a two-eleme phase-sweeping interferometer located at Boulder. An ionospheric sounder operating at Ellswort Nebraska, provides simultaneous vertical-incidence measurements of the ionosphere along the pat Amplitude scintillations observed at Boulder over a six-month period are compared with the ion grams taken at Ellsworth. Positive correlation is found between amplitude scintillations a spread F, while a small negative correlation is found with sporadic E. The present result appea to be significant but a full year's data are being accumulated to disclose seasonal or diurnal effec Detailed analysis of the scintillations indicates that the probability distribution of the amplitu can be represented by the Rice probability distribution function. The scintillation rate for 108 m seems to be more rapid than for 53 mc/s. *Subject Headings:* **1. Radio star scintillation 2. Spread 3. Sporadic E layer (Es).**—*Authors' abstract.* Ⓢ

11F–75 551.510.535:535.345:537.5

*†Lee, Po (*Dept. of Physics, Univ. of Southern California at L. A.*), **Photodissociation and phot ionization of oxygen (O_2) as inferred from measured absorption coefficients.** *Optical Society America, N. Y., Journal,* 45(9):703–709, Sept. **1955.** 11 figs., 7 tables, 24 foot-refs. **DLC**—Abson tion coefficients, k, of O_2 between 1320 A and 200 A were measured using a 2-meter grazing inciden vacuum spectrograph. Three weak dissociation continua above 1040 A have been investigate The "first continuum" between 1320 A and 1270 A had a maximum k-value of 13 cm^{-1} at 1295 . another one between 1220 A and 1096 A was found to have a $k = 0.23$ cm^{-1}, and the third one betwe 1096 A and 1040 A had a value of about 3 cm^{-1}. The absorption near Lyman α and in various oth "atmospheric windows" in adjacent regions is given. Between 1040 A and 740 A strong absorpti was observed due to diffuse bands, which were superimposed over the first ionization continuu with a maximum of 100 cm^{-1} at 920 A. The main ionization continuum had a long wavelengt limit at 683 A and a flat maximum of 590 cm^{-1} at 510 A. (In addition low absorption coefficien of less than 1 cm^{-1} have been found in N_2 between 1040 A and 910 A.) As an application of the data, a survey calculation on ionospheric absorption was made which showed that the formation the E layer at 100 km may be due to the absorption of solar radiation by the first ionization continuu of O_2. It is also shown that solar radiation between 1220 A and 1100 A can reach the height of t D layer by passing through the indicated atmospheric windows. *Subject Headings:* **1. Absorpti coefficients 2. Photoionization of oxygen 3. Photodissociation of oxygen.**—*Author's abstract.*

11F–76 629.19:531.510.535:537

Lehnert, B. (*Royal Inst. of Technology, Stockholm*), **Electrodynamic effects connected with t motion of a satellite of the earth.** *Tellus,* Stockholm, 8(3):408–409, Aug. **1956.** 13 refs., ec **DLC**—The author presents data indicating the order of magnitude of mean free path of charged a neutral particles, number of collisions, lifetime of electrons, ion currents, charge on satellite at spee of 7.7×10^3 m/sec and height of 500 km, interaction of satellite with ions, and electrons "blasted of along lines of magnetic field, momentum transfer at and near satellite, electrostatic energy, drag, et *Subject Headings:* **1. Satellite effects in ionosphere 2. Electrodynamic effects of satellites.**—*M.R*

11F–77 621.396.812.3:551.510.535:550.38

Lindquist, Rune (*Pa. State College, Ionosph. Res. Lab.*), **An interpretation of vertical inciden equivalent height versus time recordings on 150 Kc/s.** *Journal of Atmospheric and Terrestri Physics,* London, 4(1/2):10–27, **1953.** 9 figs., 3 tables, 17 refs., 3 eqs. **DWB.** Also issued Pennsylvania. State College. Ionosphere Research Lab., Contract AF 19(122)-44, Scienti Report, No. 38, June 10, **1952.** 115 p. 27 figs., tables, 20 refs. **DWB**—Results of virtual heig versus time vertical incidence pulse recordings, obtained on 150 kc/s, are presented and discusse Monthly median values of the reflection heights are shown in a series of graphs. The coupling ech predicted by current wave theory, is definitely shown to exist. The results of measurements duri magnetically disturbed nights must be due to one type of sporadic E. Recorded groups and pha heights are compared and the differences checked against those predicted theoretically. Finall the results are given of a preliminary investigation of the effects of solar flares. *Subject Heading* **1. Ionospheric heights 2. Magnetic disturbances.**—*Author's abstract.*

11F–78 551.510.535:551.521.326

McCaulley, J. W. and Hough, W. S. (*both, Nat. Bur. of Stands. Boulder, Colo.*), **A relationship between the lower ionosphere and the (OI) 5577 nightglow emission.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2307–2313, Dec. **1959.** 5 figs., 4 tables, 10 refs. **DLC**—The results of a study comparing 5577 Å airglow intensity with ionosphere characteristics, using observations near Boulder, Colo., are presented. The analysis suggests that 5577 variations in airglow intensity can be correlated with variations of an ionospheric stratum. This stratum, as observed by low-frequency sweep soundings, is in the 90- to 110-km region. It is concluded that the observations do not uniquely support any one excitation mechanism for the 5577 emission. *Subject Headings:* **1. Ionospheric-nightglow intensity relationships 2. Ionospheric variations 3. Night airglow.**—*Author's abstract.* Ⓢ

11F–79 551.501.81:551.507.362:551.510.535

McNicol, R. W. E.; Webster, H. C. and Bowman, G. G., **A study of "Spread-F" ionospheric echoes at night at Brisbane, Pt. 1, Range spreading (experimental).** *Australian Journal of Physics*, Melbourne, 9(2):247–271, June **1956.** 26 figs., 5 photos., 3 tables, 11 refs. **DLC.** Also: McNicol, R. W. E. and Webster, H. C., **Pt. 2, Interpretation of range spreading.** *Ibid.*, p. 272–285. 8 figs., 15 refs., eqs. **DLC**—Examination of ionospheric records on 2.28 Mc/s at Brisbane, Buderim (95 km N) and Toowoomba (95 km W) shows satellite echoes accompanying the nighttime F2 echo. The characteristics of these multiplets (points of juncture, intensities, multiple hop satellites, spatial correlation, duration of multiplets and individual satellites, diurnal and seasonal distribution, relation to F and Es, etc.) are described and shown in graphs and photos of records. Movements approximately 240±140 km/hr with a direction of 290°±60°, duration averages 50 min, occurrence is more frequent in winter than summer, etc. Theories of origin are given in Part II. Motions are considered to be wave motions rather than a drift of ionosphere. Only a few of the multiplets are thought to be due to Es scatter with return path via F2. *Subject Headings:* **1. Spread-F 2. Atmospheric tides 3. Sporadic E layer (Es) scatter 4. Brisbane, Australia.**—*M.R.*

11F–80 551.510.535:551.594.13

Maeda, Ken-ichi (*El. Comm. Lab., Ministry of Telecom., Japan*), **Dynamo-theoretical conductivity and current in the ionosphere.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 4(2):63–82, July **1952.** **DLC**—Tensor expressions of anisotropic velocity and conductivity of a simple ionized gas in magnetic field is applied to the ionosphere as a heterogeneous ionized medium. It is shown that the vertical electric current in the ionosphere is suppressed down to a negligible magnitude, and under this condition the specific conductivities of the ionosphere are derived. With these conductivities the dynamo-theoretical equation is constructed and solved for some special models of the ionosphere. The directional conductivities of the ionosphere are introduced and explained. The vertical motion of electrons and ions in the ionosphere is considered and its importance is briefly noted from the viewpoint of the ionospheric distribution. *Subject Headings:* **1. Dynamo-theory of the ionosphere 2. Ionospheric conductivity 3. Ionospheric currents.**—*Author's abstract.*

11F–81 551.510.535:551.594.5

Mahlum, Bernt (*Norwegian Def. Res. Establ. Kjeller, Lillestrom, Norway*), **Anisometry in the fading pattern of sporadic E as observed near the auroral zone.** *AGARDograph*, Paris, No. 34:163–168, Sept. **1958.** 3 figs., 4 refs. **DWB** (629.1323 N864a). Summary by N. J. Skinner, J. Hope, and R. W. Wright in *Nature*, London, 182:1363, **1958.**—The diffraction pattern formed over the ground from the sporadic E-layer has been studied at Tromso (67° geom. lat.). The irregularities in the diffraction pattern are found to be elongated in an east-west direction, and velocities of drift up to 1600 m/s of the irregularities have been observed. *Subject Headings:* **1. Sporadic E layer (Es) 2. Ionospheric drift velocities 3. Tromsö, Norway.**—*Author's abstract.*

11F–82 551.510.535:551.594.12

Mariani, F., **Densità elettronica in una ionosfera non isoterma.** [Electron density in a non-isothermal ionosphere.] *Annali di Geofisica*, Rome, 9(1):43–62, Jan. **1956.** 10 figs., 4 refs., 33 eqs. English summary p. 61. **DLC**—This paper theoretically deals with the effects of the terrestrial curvature on the ionization intensity and on the electron density in a nonisothermal atmosphere, for the two cases in which (1) the temperature gradient has a constant value at every height or (2) assumes the value 0 above a given height. A general relation is found between temperature electron density, generalized recombination coefficient, matter density and absorption coefficient of the ionizing radiation, valid, in stationary conditions, for a monochromatic radiation. *Subject Headings:* **1. Ionospheric electron density 2. Nonisothermal atmosphere 3. Ionization intensities.** —*From author's abstract.*

11F–83 551.510.535:551.594.12

Mariani, F., **Variazioni stagionali e non stagionali della densità elettronica ionosferica.** [Seasonal and non-seasonal variations of the ionospheric electron density.] *Annali di Geofisica*, Rome, 10(1/2):165–181, **1957.** 10 figs., 3 tables, 13 refs., 7 eqs. Italian and English summaries p. 180–181. **DLC**—A comparative study of the component N_{12} of twelve months period, present in the series of the median monthly values of the maximum electron densities in the F2 layer, for about 20 Observatories located between the geographical latitudes 52°N and 43°S, during the years 1949–1954, shows that its behaviour at noon exhibits a substantial phase-agreement between the geomagnetic latitudes 53°N and 35°S; at midnight, instead, the component N_{12} exhibits a phase shift of 180° at the two sides of the equator. With regard to the F1 and E layers one sees that they exhibit only seasonal characteristics. At first sight, the behavior of N_{12} in the F2 layer could be attributed to a non-seasonal component having a twelve months period but the same phase in the two hemispheres superposed to the normal seasonal component; however the detailed analysis of the noon and midnight behaviors of N_{12} in the F2-layer leads to the conclusion that the eventual non-seasonal component cannot be attributed either to a radiation source external to the solar system or to the annual variations of the Sun-Earth distance, greater during summer and smaller during winter. At this stage of our knowledge, one could accept the view of a connection of the features of N_{12} in the two hemispheres with the phenomena of general circulation in the high atmosphere. *Subject Headings:* **1. Ionospheric electron density variations 2. Atmospheric circulation effects on ionosphere.**—*Author's abstract.*

11F–84 551.510.535:551.594.13

Martyn, D. F. (*C.S.I.R.O., Camden New South Wales, Australia*), **Large-scale movements of ionization in the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2178–2179, Dec. **1959.** ref. **DLC**—The complexity of the causes of variations in and motions of ionization in the ionosphere is noted, as is the difficulty of differentiating real and virtual motions. An instability mechanism for deviations in ionization density is suggested, for which the predicted temporal and spatial morphologies appear to be consistent with those of the occurrence of sporadic E, spread F, and radio-star scintillations. *Subject Heading:* **1. Ionospheric movements.**—*Author's abstract.* Ⓢ

11F–85 551.510.535:551.521.17

*Michard, Raymond, **Le contrôle de l'ionosphère par le rayonnement ultraviolet solaire.** [Control of the ionosphere by ultraviolet solar rays.] *International Council of Scientific Unions, Brussels: Eighth Report of the Commission for the Study of Solar and Terrestrial Relationships.* Paris, **1954**, p. 81–91. 62 refs. **DWB**—Numerous works since 1950 are referred to. The report summarizes statistical work on the solar control of ionized layers, especially F2, ionospheric observations during eclipses, sudden ionospheric disturbances and theories of origin of ionospheric layers. These involve variations of physical state and composition with height, ionizing solar radiation, photoionization and recombination, on all of which important data have been obtained by rockets. *Subject Headings:* **1. Ionospheric theory 2. Ultraviolet effects.**—*C.E.P.B.*

11F–86 551.510.535:551.594.13:523.74

Minnis, C. M., **Brightening of the solar limb in the far ultraviolet.** *Nature*, London, 176(4483): 652–653, Oct. 1, **1955.** table, 3 refs. **DWB**—Electron density in E and F1 regions was measured at Inverness and Slough during eclipse of June 30, 1954. In spite of the absence of visible centers of solar activity only 92% of ionizing radiation can be accounted for by a uniformly radiating disk. The evidence points to brightening of the limb by 5% near the equator and darkening by 3% near the poles. A small bright spot was noted. *Subject Headings:* **1. Ultraviolet solar radiation 2. Ionospheric electron density.**—*C.E.P.B.*

11F–87 551.510.535:523.746

Minnis, C. M. (*Radio Research Station, Ditton Park, Slough, Bucks*) and Visser, S. W. (*Friedhoff 4, Ellecom, The Netherlands*), **Behaviour of the present sunspot cycle.** *Nature*, London, 182(4649): 1599–1600, Dec. 6, **1958.** 1 fig. **DWB**—Visser (*Nature* 182 p. 253, **1958**) has stated that no correlation existed between an unspecified ionospheric index and simultaneous change in the relative sunspot number and that the rapid increase in sunspot number in 1957 was not accompanied by a corresponding increase in the ionospheric index. The author points out that tables have recently been prepared of the monthly mean values of two ionospheric indices I_E and I_{F^2}, based respectively on the degree of ionization in the E and F2 layers and presents the unsmoothed values of these indices for the period Jan. 1955 to 1958, together with the rotational mean values of the sunspot number as given by Visser. Both the ionospheric indices and the sunspot numbers are shown to vary in a similar way and even the smaller irregularities in the trend are sometimes visible in all the curves. *Subject Headings:* **1. Ionospheric indexes 2. Sunspot numbers 3. Sunspot-ionosphere correlations.**—*I.L.D.*

11F–88 523.74:551.510.535:621.396.8

Minnis, C. M. and Bazzard, G. H. (*both, D.S.I.R. Radio Res. Station, Slough*), **Some indices of solar activity based on ionospheric and radio noise measurements.** *Journal of atmospheric and Terrestrial Physics*, New York, 14(3/4):213–228, June **1959.** 5 figs., 4 tables (in appendix), 10 refs., 17+4 eqs. **DWB, DLC**—The critical frequencies of the E and F2 layers of the ionosphere are closely controlled by the level of solar activity but, at any fixed point on the earth's surface, they also vary with season owing to the annual change in the solar zenith angle. A critical frequency can only be used to provide an index of solar activity if such seasonal variations can be eliminated or reduced to very small proportions. Methods of achieving this are described and monthly mean values of an E- and an F2-layer index are tabulated for the period 1938–1957. The correlation of these indices with each other and with the solar noise flux at λ10.7 cm is high. Some possible practical applications of such indices are discussed briefly. *Subject Headings:* **1. Solar activity indexes 2. E layer critical frequencies 3. F2 layer critical frequencies.**—*Authors' abstract.* Ⓢ

11F–89 551.510.535:551.594.13

Mitra, A. P., **Some relationships between the F1 and the F2 regions of the ionosphere.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 79, November 30, **1955.** 26 p. 12 figs., table, 10 refs., 9 eqs. **DWB**—In this report, analysis of the fluctuations in the height and electron density of the F1 and the F2 regions of the ionosphere is continued. Although the work was originally undertaken to assess the merit of the hypothesis of the common origin of the F-layers, it became obvious at a later stage of the analysis that the close relationship that undoubtedly exists between the two regions is predominantly of dynamical origin. If fluctuations of solar origin exist, they must be small. A remarkable feature of the fluctuations at Washington is that, both for electron density and height, the percentage variations in the F2 region are, on the average, about four times as large as those in F1. The same relationship is maintained for variations associated with geomagnetic disturbances. For both regions the daily variations of height and electron density are closely related, but an increase in height is associated with a decrease in electron density and vice versa. For 3-day running averages of the indices, the relationships between the heights and electron density in the two regions are given by:

$$P(N_m\mathrm{F2}) = -1.3\,P(h'\mathrm{F2}) - 0.6\,P^2(h'\mathrm{F2})$$
$$P(N_m\mathrm{F1}) = -P(h'\mathrm{F1})$$

Subject Headings: **1. Ionospheric electron density 2. F1-F2 relationships 3. F layer height.**—*Author's abstract.*

11F–90 551.510.535:551.594.12

Mitra, A. P., **Time and height variations of the daytime dissipative processes in the ionosphere.** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 99, Jan. 1, **1958.** 70 p. 13 figs., 9 tables, 29 refs., 104 eqs. **DWB.** Also **Pt. 1** [of this paper], **A noontime model of the ionosphere loss coefficient from 60 to 600 km over middle latitudes.** *Journal of Geophysical Research*, Wash., D. C., 64(7):733–743, July **1959.** 4 figs., 6 tables, 29 refs., 31 eqs. **DLC**—This work deals with the height variations of the various dissipative processes occurring in the ionosphere over a height range of 50 to 600 km, and is an extension of the earlier work by Mitra and Jones (1954). An expression is given for the calculation of the loss coefficient over the entire ionosphere. For noon conditions, defined by the hours 1030 to 1330 LMST, and for stations in the northern middle latitude zone, the equation for the loss coefficients for heights in the range of 50 to 600 km is

$$a = 5\times10^{-21}\,n(\mathrm{O_2}) + 3\times10^{-20}\,n(\mathrm{O}) + \frac{2\times10^{-19}\,n(\mathrm{O_2})}{2\times10^{-11}\,n(\mathrm{O_2}) + 1\times10^{-8}\,N_e} + 1\times10^{-12}\ \mathrm{cm^3/s}$$

At any particular height the loss coefficient shows an oscillatory diurnal variation. It is suggested that this variation is a result of layer distortion by vertical ionization drifts whose amplitude at the lower ionospheric heights is estimated to be about 5 km/h with phase such that maximum upward velocity occurs at 13:30 hours. An equation is given which will enable computation of the resultant loss coefficient as a function of height and time on the basis of this hypothesis. *Subject Headings:* **1. Ionospheric heights 2. Diurnal ionospheric variations 3. Ionospheric ionization.**—*Author's abstract.* Ⓢ

11F–91 551.510.535:551.508.96

Murty, T. V. S. (*Banaras Hindu Univ., Banaras, India*), **Design and development of a simple ionospheric equipment.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 15(2):70–74, Feb. **1956.** 9 figs., 12 refs. **DWB, DLC**—A compact and simple manually operated medium power ionospheric sounding transmitter and receiver was constructed in the Banaras Univ. laboratories. The design and circuits, records and sensitivity and selectivity curves are illustrated.

A cathode-ray oscillograph is used for reproducing the pulses. Scattering of radio waves can b studied by means of the pulses. *Subject Heading:* **1. Ionospheric sondes.**—*M.R.*

11F–92 551.510.535:551.594.13:551.510.62:621.39

Murty, Y. S. N.; Singh, R. N. and Khastgir, S. R., **Ionospheric absorption and electron colli sional frequency in the F region.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi 18(11):507–509, Nov. **1959.** 2 figs., 4 eqs., 9 refs. **DWB, DLC**—The total absorption of radio waves proceeding vertically upwards through the E layer and suffering reflections from the F layer has been determined over a range of frequencies from nearly 3 to 7 Mc/s. by measuring the most probable values of the signal amplitudes of the first and second orders of ionospheric reflection. In some measurements, continuous photographic records of the signal amplitudes of the first and second orders of ionospheric reflection have been simultaneously taken and the method has proved useful for the quick and accurate study of the variation of the ionospheric absorption with frequency. The electron collisional frequency (ν) in the F region has been calculated by applying Appleton's modified formula (connecting the electron collisional frequency with reflection coefficient and group path) near the critical penetration frequency. The mean value of ν in the F region has been found to be 4 kc/s. which agrees well with the values obtained by other workers. *Subject Headings:* **1. Ionospheric absorption measurements 2. Electron collisional frequencies.**—*Author's abstract.* Ⓢ

11F–93 551.510.535:621.396.

Neužil, L. (*Astron. Inst. Ondrejov*), **Fluctuations de courte durée de la fréquence critique de la couche sporadique Es.** [Short period fluctuations in critical frequency for the sporadic Es layer. *Bulletin of the Astronomical Institutes of Czechoslovakia*, Prague, 5(4):79–82, July 1, **1954.** 3 figs. 3 refs. Russian summary p. 81–82. **DLC**—Irregularities in the curves representing annual variations in the intensities of short-term fluctuations of Es critical frequency (1947–1949) are attributed to effects of the Perseids, Lyrids and Aquarids. *Subject Headings:* **1. Ionospheric critical frequencies 2. Sporadic E layer (Es).**—*G.T.*

11F–94 551.510.535:537.563:535.42

New York Univ. Inst. of Mathematical Sciences. Div. of Electromagnetic Research, **Theory of dissociation and recombination processes in the ionosphere.** Contract AF 19(122)-463, Final Report, June **1956.** 10 p. Research reports and publications on the contract, p. 8–10.—Between March 1950 and June 1956, 25 reports were issued under this contract and 80% of these were published in scientific journals. Work done is summarized under several headings: I. Properties of the ionosphere; II. Many particle scattering problems; III. General scattering theory; IV. Molecular scattering problems; V. The inverse scattering problems. *Subject Headings:* **1. Ionospheric scattering research. I. Kline, Morris** (*proj. dir.*).—*M.R.*

11F–95 551.510.535:551.594.5:621.39

Nichols, B. (*Cornell Univ., N. Y.*), **Evidence of elongated irregularities in the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2200–2202, Dec., **1959.** 11 refs. **DLC**—Radio observations of backscatter from ionospheric irregularities under both auroral and nonauroral conditions indicate the presence of small scale irregularities, elongated along the earth's magnetic field. These elongated irregularities have been found at heights from 80 to 300 km. The most precise measurements available are related to echoes from auroral ionization at a height of about 100 km. These indicate scales of tens of meters along the earth's magnetic field and tens of centimeters normal to the field. *Subject Headings:* **1. Ionospheric irregularities 2. Auroral ionization echoes.**—*Author's abstract.* Ⓢ

11F–96 551.510.535:551.510.41:551.510.

Nicolet, Marcel (*C.S.A.G.I., Uccle, Belgium*), **Constitution of the atmosphere at ionospheric levels.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2092–2101, Dec. **1959.** 8 tables 37 eqs. **DLC.** Also issued as: *Belgium. Institut Royal Météorologique, Contributions*, No. 56 **1960.**—A physical picture of the upper atmosphere cannot be obtained without determining whether vertical distribution depends on mixing or diffusion or on a chemical or photo chemical equilibrium. It is necessary to determine how dissociation and recombination of molecular and atomic oxygen and nitrogen are distributed with height. The structure of the atmosphere deduced from density measurements is related to the variation of the mean molecular mass depending on diffusion effects. In addition, it is necessary to know how the heat budget is affected by conduction. *Subject Headings:* **1. Photochemistry of upper atmosphere 2. Ionospheric composition.**—*Author's abstract.* Ⓢ

11F–97 551.510.535:551.594.12

†Nicolet, Marcel (*Royal Met. Inst., Brussels*) and Aikin, A. C. (*Penn. State Univ.*), **The formation of the D region of the ionosphere.** *Journal of Geophysical Research*, Wash., 65(5):1469–1483, May

1960. 4 figs., 6 tables, 52 refs., 36 eqs. **DLC.** Also issued as Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 125, Nov. 1, **1959.** 40 p. 4 figs., 47 refs., 30 eqs. **DWB** (M10.535.P415i)—Radiations of solar origin penetrating below 85 km in the terrestrial atmosphere are: (1) X rays of $\tau < 10$ Å; (2) Lyman-alpha and (3) Wave lengths greater than 1800 Å. These radiations can ionize: (1) molecular nitrogen and oxygen; (2) nitric oxide and (3) metallic ions such as sodium and calcium. Molecular oxygen and nitrogen are also ionized by cosmic rays. The negative ion to electron ratio is important below 70 km and affects the electron distribution below that altitude. Normal ionization conditions are explained by cosmic rays and Lyman-alpha. Solar flare conditions are explained by x rays. Above 85 km, the behavior of the ionization is related to the E layer. *Subject Heading:* **1. D layer origin.**—*Author's abstract.*

11F-98 551.510.535:551.594.13:551.507.362.1

†Nisbet, John S., **Electron densities in the upper ionosphere from rocket measurements.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 126, Dec. 10, **1959.** 163 p. 51 figs., 10 tables, 77 refs., numerous eqs. **DWB** (M10.535.P415i)—An investigation of electron densities in the upper F region of the ionosphere by new techniques employing long range rockets is described. Investigations were confined to propagation measurements between the missiles and ground stations, and to methods not requiring radio links with the missile in addition to those already incorporated for telemetry and tracking purposes. The types of rockets used for the tests were determined by the requirement that suitable transmitters were carried, and that the maximum rocket altitude allowed sufficient penetration of the F region. In practice, this limited the vehicles to those with satellite launch missions, and to intermediate range ballistic missiles. Since such vehicles have considerable horizontal velocity components, it was necessary to develop suitable methods of analysis. A matrix method is described for analyzing oblique dispersion measurements to provide vertical electron density height profiles. In this method, account is taken of horizontal gradients, refraction, and the varying ray path zenith angles in the ionosphere. Two methods of measuring ionospheric dispersion were employed and compared: Faraday rotation, and a method using the difference between the apparent positions of the missile obtained by two tracking systems operating on different frequencies. Faraday rotation measurements at two receiving stations and on two frequencies were compared, to check the horizontal gradient program and the polarization of the rocket antenna. Results are given for seven experiments of electron densities and electron contents above the maximum ionization level of the F region. These are compared with results of other investigations and some conclusions are drawn about the structure of the layer and its diurnal variation. *Subject Headings:* **1. Ionospheric electron density measurement techniques 2. Rocket ionospheric data.**—*Author's abstract.* Ⓢ

11F-99 551.510.535:621.396.9

Obayashi, Tatsuzo, **Movements of irregularities in the E-region.** *Japan. Science Council. Ionosphere Research Committee,* Report of *Ionosphere Research in Japan,* 9(2):105–113, **1955.** 9 figs., 8 refs., 3 eqs. Also in *Japan. Radio, Research Laboratories, Tokyo, Journal,* 2(7):59–67, Jan. **1955. DWB**—Movements of large scale irregularities in the *E* region have been deduced from the observations of fading patterns of medium radio waves transmitted from three broadcasting stations spaced about 150 km at the vertices of a right triangle, as received at Hiraiso situated 350~400 km apart. The speeds and directions of movement are determined by the time difference of each record, which can be observed as the transit of some characteristics on fading patterns caused by the travelling of large scale irregularities from one propagation path to another. Observations were carried on every day from July to December 1954. The movements appear to have flowed predominantly towards the west during the night and the east during the morning with velocities ranging 5~150 m/sec. The examination of the results for NS and EW components for the winter suggests the presence of the diurnal variation of direction. The average vector of movements during the night is also found to exhibit some seasonal change. By comparing the simultaneous records of ionospheric observation (vertical incidence) with the fading records of three separated points of reflection, we have found as an example that the moving cloud, which is observed as very rapid faded with a duration of a few hours, has some correlation with the sporadic ionization cloud, and its turbulent velocities are of the order of 10~15 m/sec. *Subject Headings:* **1. E layer 2. Ionospheric movements.** —*Author's abstract.*

11F-100 551.501.81:551.510.535

O'Brien, D. J. and Ross, W. J., **Vertical incidence equivalent height recordings at 75 kc/s.** Pennsylvania, State Univ. Ionosphere Research Lab., Contract AF 19(604)-3875, Scientific Report, No. 110, Sept. 1, **1958.** 91 p. illus., tables. (Original unchecked) (ASTIA AD-209-015)—The results of vertical incidence pulse sounding of the ionosphere at 75 kc from Oct. 1955 to Feb. 1957 are presented in tabular form. Median curves are drawn and discussed briefly. Comparisons are

made with the records taken previously at 150 kc. The main classes of complex echoes are show and discussed briefly and compared with similar records at 150 kc. *Subject Headings:* **1. Ionospheri height recordings 2. Ionospheric echoes.**—*TAB abstract.*

11F–101 551.510.535:621.396.8:551.551.

Obukhov, A. M., (*Inst. of the Physics of the Atmosphere, Academy of Sciences, Moscow*), **Scatterin of waves and microstructure of turbulence in the atmosphere.** *Journal of Geophysical Researc* Wash., D. C., 64(12):2180–2187, Dec. **1959.** 7 figs., 20 refs., 4 eqs. **DLC**—The paper deals with brief survey of the theory of scattering of waves by turbulent inhomogeneities. Experiments on th study of scattering phenomena of sound by turbulence in the surface layer of the atmosphere ar discussed. These experiments were carried out to obtain some information of the turbulent spec trum; their results are compared with the data of meteorological measurements in the surface layer Applying the method of scattered radio waves to the study of turbulence in the ionosphere is dis cussed. *Subject Headings:* **1. Ionospheric scattering 2. Turbulence in the ionosphere.**—*Author' abstract.* Ⓢ

11F–102 551.510.535:551.594.12:523.7

Osborne, B. W. (*Malaya Univ., Singapore*), **The electron content of the F2 layer above Singapore** *Journal of Atmospheric and Terrestrial Physics*, London, 4(1/2):82–84, **1953.** 2 figs., table, 5 refs **DWB**—Ratio of total ionization present in a unit column n below the level of maximum intensit of F2 layer between 1949 (great solar activity) and 1952 (slight solar activity) at Singapore is show in 2 figures for June and Dec., respectively. The ratio is 1.2 and 1.4 to 1 compared with 2 to 1 fo Alaska and Watheroo, and 1.8 to 2.8 to 1 for Huancayo. Although ratios are not great at Singapor the shapes of the 1949 and 1952 diurnal curves differ because of ionization, moving above level c maximum ion density. *Subject Headings:* **1. F2 electron density 2. Solar-ionospheric relationship 3. Singapore.**—*M.R.*

11F–103 551.510.535:551.594.5:551.521.32

*Pfister, Wolfgang; Keneshea, T. J. et al., **The ionosphere.** (In: **Handbook of geophysics fo Air Force designers,** ed. by C. F. Campen, Jr., et al. 1st ed. Wash., D. C., **1957.** Ch. 15 (29 p 64 figs., table, 7 refs., 4 eqs.) **DWB**—A condensed review of the available data on ionospheri ionization, aurorae and airglow as related to radio propagation, with extensive graphical (charts maps, records, diagrams) illustrative material on the E, F2, Sporadic E and auroral distribution in space and time and their interrelationship and relationships with sunspot activity, magneti activity, altitude, critical frequency, etc. Recently compiled world-wide charts are presented fo many of these elements. *Subject Headings:* **1. Ionospheric data 2. Auroral distribution 3. Airglov data. I. Markham, T. P. II. Carrigan, A. L. III. Oliver, N. J.**—*M.R.*

11F–104 551.510.535:551.507.362.

Pfister, Wolfgang (*U. S. A. F., Cambridge, Res. Center, Bedford, Mass.*), **Measurement o ionospheric fine structure by high altitude rockets.** *AGARDograph*, Paris, No. 34:183–192, Sept **1958.** 5 figs., 2 refs. **DWB** (629.1323 N864a)—In the U. S., two methods are being used for th determination of electron density distribution from rocket experiments: the pulse delay method an the phase delay method. The results derived from both of these methods are different in one respect The stratifications appear considerably more pronounced in the pulse delay method. The indication are that a basic difference exists in the way both methods respond to the existence of horizonta irregularities in the ionosphere. In the pulse delay experiment, two features have been include which permit an estimate of the structure size of the irregularities. It is a variation of the frequenc in seven steps between 4 and 5 Mc/s and it is the reception of the signal with three closely-space antennas. A preliminary analysis of some of the rocket data gave 1.8 km and 0.3 km, respectively for the structure size. The predominant feature of the results from pulse delay experiments is pronounced stratification of the electron density as representing mean electron density with preferre levels at 94, 100, 106, 112, 118, and 128 km. The results cannot be interpreted as representing mea electron densities for the height levels concerned. However, the apparent stratification is though to be produced by an alignment of blobs of ionization at those preferred levels. *Subject Headings* **1. Rocket ionospheric data 2. Ionospheric electron density measurement techniques.**—*Author' abstract.*

11F–105 551.501.8:551.510.53

Piggott, W. R. (*D.S.I.R. Radio Res. Station, Slough, Bucks*), **A rapid method of obtaining accurat virtual heights from an ionogram.** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2) 175–177, April **1959.** 2 figs., ref., eq. **DLC**—A transparent slider is described which corrects th virtual height on an ionogram for changes due to varying echo amplitude and which enables accurat

virtual heights to be obtained rapidly. *Subject Headings:* **1. Ionograms 2. Virtual height calculations.**—*Author's abstract.* Ⓢ

11F–106 551.510.535:523.75:551.557.2

Rao, B. Ramachandra and Bhagiratha Rao, E. (*both, Ionospheric Res. Lab. Andhra Univ., Visakhapatnam*), **Effect of enhanced solar activity on the F2 region drifts at Waltair.** *Journal of Scientific and Industrial Research*, New Delhi, Sec. A, 17(12), Special Supplement, Dec. **1958.** p. 59–62. fig., table, 7 refs. **DWB, DLC**—This is the first systematic investigation of a problem of this nature. The spaced receiver method used was modified by using a triple beam oscillograph for recording the fading patterns, frequency 6.0 Mc/s. SWI as obtained June 1957–June 1958 represented by 21 days are analyzed, first plotted separately, then mean curves were drawn. Daily variation of NS and EW curves shows the NS variation to be considerably affected on SWI days when prominent solar flares were reported, otherwise not. *Subject Headings:* **1. Ionospheric drift measurements 2. Solar flare effects on ionosphere.**—*W.N.*

11F–107 551.557.2:551.510.535

Rao, B. Ramachandra and Bhagiratha Rao, E. (*both Ionospheric Research Laboratories, Andhra Univ., Waltair, India*), **Horizontal ionospheric drifts in the F2-region at equatorial latitudes.** *Nature*, London, 181(4623):1612–1613, June 7, **1958.** fig., table, 5 refs. **DWB**—This review discusses the various ionospheric F2-region drifts which had been studied in detail at a number of high-altitude stations. Reference is made to Briggs and Spencer, *Rep. Prog. Phys.* 17, 245 **(1954)**; Martyn, D. F., *Physics of the Ionosphere*, 163 **(1955)**; Purslow, B. W., *Nature*, 181, 35 **(1958)**; Mitra, S. N., *Proc. Inst. Elect. Eng. Part* 3, 96, 441 **(1949)**; Rao, B. R., Rao, M. S., and Murty, D. S., *J. Sci. Indust. Res.*, 15A 75 **(1956)**. A detailed account of the same investigation will be published in the near future. *Subject Heading:* **1. Ionospheric drift measurements.**—*N.N.*

11F–108 551.510.535:551.557.2:621.396

Rao, B. Ramachandra and Murty, D. Satyanarayana (*both, Ionospheric Res. Lab. Andhra Univ., Visakhapatnam*), **A new continuous wave radio method for the study of ionospheric drifts.** *Journal of Scientific and Industrial Research, Sec. A*, New Delhi, 17(12), Special Supplement, Dec. **1958.** p. 63–67. 2 figs., 2 tables, 3 refs. **DWB, DLC**—A simplified method is described, involving transmission from a distant sender received by three simple vertical aerials at the corners of a right angled triangle, signal strength being recorded side by side on a photographic paper. Sectional view is given. Comparison with other methods show that this method yields consistently reliable results. Another advantage is that choice of proper frequencies enables drift measurements at different ionospheric locations from the very same receiving center. *Subject Heading:* **1. Ionospheric drift measurement techniques.**—*W.N.*

11F–109 551.557.2:551.510.535:550.386.6

Rao, B. Ramachandra; Bhagiratha Rao, E. and Ramana Murty, Y. V. (*all, Ionospheric Res. Lab. Andhra Univ., Waltair*), **Effect of magnetic activity on drifts of the F2 region.** *Nature*, London 183(4662):667–668, March 7, **1959.** fig., 4 refs. **DWB**—Ionospheric drift observations made at Waltair (mag. lat 9°30′N) over a period of 16 months during Feb. 1956 and May 1958, are analyzed. This preliminary report uses 466 observations in plotting a graph of the variations of the speed of drifts of the F2 region with geomagnetic index and obtains a mean straight line which indicates that there is a decrease of mean drift speed of the F2 region with increase of magnetic activity in the range of 0–6. *Subject Headings:* **1. Magnetic effects on ionosphere 2. Ionospheric drift measurements.**—*N.N.* Ⓢ

11F–110 551.557.2:551.510.535

Rao, B. Ramachandra and Bhagiratha Rao, E. (*both, Ionospheric Lab. Andhra Univ. Waltair*), **Study of horizontal drifts in the F1- and F2-regions of the ionosphere at Waltair (17°43′N, 83°18′E, mag. lat. 9°30′N).** *Journal of Atmospheric and Terrestrial Physics*, London, 14(1/2):94–106, April **1959.** 5 figs., 4 tables, 11 refs. **DLC**—Results of the analysis of drift measurements made at Waltair for the F1- and F2-regions over a period of 2 years are presented in this paper. The main features of the diurnal and seasonal variation of drifts in F2-region are given in detail. The general pattern of drift movements for this low latitude station is found to be in phase opposition to those observed at high latitudes, thus confirming F2-region drift theory given by MARTYN (1955). *Subject Headings:* **1. Ionospheric drift measurements 3. Waltair, India.**—*Authors' abstract.* Ⓢ

11F–111 551.557:551.510.535:551.594.12

Rao, M. N. and Mitra, A. P. (*Radio Propagation Unit, New Delhi*), **Effect of vertical drifts on the nocturnal ionization of the lower ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):271–290, Feb. **1959.** 14 figs., 2 tables, 18 refs., 12 eqs. **DLC**—Effect of vertical

ionic drift velocities on the night-time ionization density in the lower ionosphere for heights ranging between 80 km to 130 km is studied by a method of successive approximation. Values are also given of the effective recombination coefficient as a function of height and time for these drift velocities. Velocities ranging from 1 to 20 km/hr are used. The resultant ionization profiles for velocities 1–5 km/hr represent magnetically quiet conditions, while those for higher velocities would represent disturbed conditions of increasing severity. It will be noted that the ionization density decreases for upward drift and increases for downward drift. The present work provides a quantitative explanation of the sudden cessation of night-time echoes of low-frequency radio waves at times of magnetic disturbances, such as those observed at the Pennsylvania State Univ. (LINDQUIST, 1953). *Subject Headings:* **1. Ionospheric vertical drift 2. Ionospheric ionization.**—*Authors' abstract.* Ⓢ

11F–112 551.557:551.510.535:621.396.8

Rao, M. Srirama (*Andhra Univ., Waltair, India*), **Size of irregularities in the E region of the ionosphere.** *Canadian Journal of Physics*, Ottawa, 37(5):557–568, May **1959.** 9 figs., 17 refs., 11 eqs. **DWB, DLC**—Three-station fading records taken at Ottawa on frequencies ranging between 2.0 and 2.6 Mc/s have been analyzed to determine the E region wind velocities (V) and frequencies of fading (N) for the period June 1953 to April 1955. An empirical relation $V = 2.41\ N\lambda$ has been deduced, on a statistical basis, to represent the above observations. In this equation, λ represents the wavelength of operation. The constant of proportionality (K) in this relation has been studied comparatively for three different locations in the Northern Hemisphere. This constant has been related to a characteristic length L which specifies the horizontal size of the irregularities in the E region of the ionosphere by the equation: $L = (1/2)K\lambda$. Variation of this size with latitude is discussed. *Subject Headings:* **1. E layer wind velocities 2. Ionospheric irregularities 3. Ottawa, Canada.**—*Author's abstract.* Ⓢ

11F–113 551.510.535:551.594.12

Rastogi, R. G. (*Nat'l. Res. Council, Ottawa, Canada*), **The diurnal development of the anomalous equatorial belt in the F2 region of the ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(7):727–732, July **1959.** 4 figs., 25 refs. **DLC**—The latitudinal variation in the critical frequency of the F2 layer was studied for each hour of the day during the equinoctial months of a year at sunspot minimum. The middle latitude maxima first develop at low latitude and shift poleward with the progress of the day, the course being reversed in the evening hours. The double maxima in the diurnal variation of foF2 are less separated with increasing latitude and finally converge to a single maximum at a dip of about 25°. These two anomalies in foF2 are suggested as being due to the vertical drift of ionization, together with its motion towards the poles in the morning and towards the equator in the afternoon. Other anomalies of F2 can be also explained by a meridional transport of ionization. *Subject Headings:* **1. F2 layer critical frequency anomalies 2. F2 layer ionization 3. Diurnal F2 layer critical frequency variations.**—*Author's abstract.* Ⓢ

11F–114 551.510.535:550.388.2

Rastogi, R. G. (*Nat. Res. Coun. Postdoctorate Fellow*), **Magnetic control on the variations of the critical frequency of the F2 layer of the ionosphere.** *Canadian Journal of Physics*, Ottawa, 37(7):874–879, July **1959.** 3 figs., 16 refs. **DWB, DLC**—The paper discusses the comparative influence of the true magnetic and smooth geomagnetic latitudes on the diurnal and latitudinal variations of the critical frequency of the F2 layer (foF2) at low latitudes. The diurnal variations of foF2 are shown to differ considerably at stations having the same geomagnetic latitude, but the discrepancies disappear when the true magnetic latitude is taken into consideration. The latitudinal variation of noon values of foF2 is also shown to present discrepancies for low latitude stations in the geomagnetic latitudes plot, but on true magnetic latitude plots the points fall regularly along a smooth curve. *Subject Headings:* **1. F2 layer critical frequencies 2. foF2 variations 3. Geomagnetic latitude effects on F2 layer.**—*Author's abstract.* Ⓢ

11F–115 551.501.83:551.510.535:551.594.12

†Revellio, Karl, **Die atmosphärischen Störungen und ihre Anwendung zur Untersuchung der unteren Ionosphäre.** [Atmospheric disturbances and their application in the study of the lower ionosphere.] *Weissenau, Germany. Max Planck-Institut für Physik der Stratosphäre, Mitteilungen*, No. 8, **1956.** 54 p. 82 figs., 46 refs., eqs. German summary p. 1. **DWB** (M10.53 W433m)—Atmospheric disturbances (atmospherics) may provide information on the state of the lower ionosphere in different ways. Their form makes it possible to determine the height of reflection and distance of the center by considering the multiple reflections from the ionosphere and the ground. The decrease in pulse amplitude with the number of reflections is an indication of reflection coefficients and electron densities. The variety of pulse forms makes it difficult to interpret such forms, but all wave forms can be reduced to a reflection model. The rate of occurrence of disturbances is

strongly dependent on frequency, time of day and season. Phenomena at sunrise were clarified by comparison with field strengths of signals received from a sender. They give indications of the UV-absorbing region at the upper limit of the ozone layer. During the solar eclipse of June 30, 1954 an increase in the number of atmospherics was observed and from this fact a decrease of attenuation in the lower ionosphere was deduced. *Subject Headings:* **1. Sferics reflections from ionosphere 2. Ionospheric attenuation.**—*Transl. of author's abstract.*

11F–116 551.510.535

Rogers, G. L., **Diffraction microscopy and the ionosphere.** *Journal of Atmospheric and Terrestrial Physics*, 10(5/6):332–337, **1957.** fig., table, 11 refs. **DWB**—The application of diffraction microscopy to Mitra records is considered. It is shown that its application to existing records might result in some slight improvement, probably scarcely justifying the effort. If, however, tests should show that the combination would work with aerial spacings of 3–10λ, the advantages of the combined method would be substantial. An important practical limitation on any type of Mitra method is the complexity of the record normally obtained, and it may prove impossible adequately to analyse any but the simplest of them by any technique. The question of future development is briefly touched on. *Subject Heading:* **1. Ionospheric research.**—*Author's abstract.*

11F–117 551.507.362.2:551.510.535:621.396.1

Ross, W. J., **Ionospheric investigation from satellite radio observations, Pt. 1, Doppler effect recording instrumentation.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-4563, Scientific Report No. 120, June 30, **1959.** 81 p. 24 figs., eqs., 14 refs. **DWB** (M10.535 P415i)—A brief survey is made of the main features of satellite transmitters and of the ionospheric propagation effects produced in the radio waves from them. From these considerations, the desirable properties of the transmitter are summarized and the necessary properties of the receiving apparatus are inferred. Detailed descriptions of the various units of the receiving instrumentation are then given, followed by the presentation of a sample record analyzed to yield electron content of the ionosphere. *Subject Headings:* **1. Satellite ionospheric observations 2. Ionospheric radio wave propagation.**—*Author's abstract.* Ⓢ

11F–118 551.557:551.510.535:551.551.5

†Sales, G. S., **A summarization of turbulence and ionospheric "wind" measurement theories with application of the latter to preliminary data at 75 kc/s.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(604)-1304, Scientific Report No. 88, Aug. 1, **1956.** 133 p. 37 figs., 5 tables, 37 refs., numerous eqs. **DWB**—The initial problem presented in this report is a study of the modern theories of turbulence and their application. Besides the historical introduction, which is the first section, the work is divided into three main parts. The classical and statistical theories of turbulence are discussed in the first two sections and their applications in the third. The application of most interest here is the study of ionospheric "wind" motions. This problem is gone into in some detail with a summary of the experimental and analysis work necessary for obtaining the desired information. The main purpose for studying ionospheric "winds" is to achieve an understanding of the dynamics of the ionosphere and provide information as to the daily variation of "winds." *Subject Headings:* **1. Ionospheric wind measurement 2. Turbulence in the ionosphere.** —*Author's abstract.*

11F–119 551.510.535:551.594.13

†Sato, Teruo (*Geophy. Inst., Kyoto Univ.*), **On anomalous variations of maximum electron density and its height in the F2 region of the ionosphere.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 6(3):99–119, Sept. **1954.** 11 figs., 2 tables, 28 refs., 23 eqs. **DLC**—An attempt to explain the anomalous variations in maximum electron density (proportional to f_oF2) and h_pF2 (height of F2 region). It is concluded that these variations are controlled by geomagnetic latitude and by geographic latitude and solar activity as well. The seasonal anomaly of f_oF2 cannot be accounted for by vertical drift, but by seasonal variations in height distribution of ionized particles responsible for the f_oF2 variation. *Subject Headings:* **1. f_oF2 variations 2. Ionospheric electron density variations.**—*M.R.*

11F–120 551.510.535

Sato, Teruo, **On anomalous variations of critical frequencies and virtual heights of the F1 and E regions of the ionosphere.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 9(4):205–214, **1955.** 5 figs., 9 refs., 4 eqs. **DWB**—Latitudinal and seasonal variations of critical frequencies f_oF1, f_oE and virtual heights (h'F1, h'E) of the F1 and E regions for years of high and low sunspot activities are investigated and anomalous variations are shown. These anomalies are analogous to those in the F2 region. The same method of explanation

for anomalies as for those in the F2 region is used. *Subject Headings:* **1. F layer critical frequencie 2. F1 layer 3. E layer 4. F layer height.**—*Author's abstract.*

11F–121 551.510.53

Sato, Teruo and Namikawa, Tomikazu (*Geoph. Inst., Kyoto Univ.*), **On latitudinal distribution of diurnal and semi-diurnal components of h'F2 of the ionosphere.** *Journal of Geomagnetism an Geoelectricity*, Kyoto, 6(3):157–159, Sept. **1954.** 8 figs., ref. **DLC**—Hourly median values of *h'F* from 36 world-wide ionospheric stations in Dec. 1945 and from 39 in June 1946 were analyzed har monically and the results are shown in figs. 1–8, plotted according to geographic and geomagneti latitudes. The amplitude is greater in the northern than in the southern Hemisphere in summer an vice versa in winter. The positive maximum occurs near noon in the N. Hemisphere and midnigh in the S. in summer and vice versa in winter. At the equator there is a time lag of 4–6 hrs. Th distribution of the semidiurnal component is similar, but of smaller amplitude than the diurna The time is near noon and midnight but there is a lag of 4–6 hours at some high latitude stations *Subject Headings:* **1. Diurnal F2 layer height variations 2. Semidiurnal F2 layer height variation 3. Latitude effects in ionosphere.**—*M.R.*

11F–122 551.510.535:551.510.65

Satyanarayana, R.; Bakhru, K. and Khastgir, S. R. (*all, Banaras Hindu Univ., India*), **Triple splitting of the F-echoes.** *Journal of Atmospheric and Terrestrial Physics*, London, 13(3/4):201–204 Feb. **1959.** 2 figs., 16 refs. **DLC**—An account is given of the polarization studies made on th triple F-echoes, obtained by employing pulses of waves of frequency, 3 Mc/s, at vertical incidence The polarization studies revealed that the first component after the ground-pulse was the norma extraordinary component having a right-handed sense of rotation, the second component was th normal ordinary component having a left-handed sense of rotation and the third component wa the Z-component having a left-handed sense of rotation. In addition to the coupling process sug gested by Eckersley and Rydbeck between the ordinary and extraordinary waves, and operative only in high geomagnetic latitudes, the partial reflection and transmission at the level of ionospheri reflection for the ordinary component have been considered as a plausible process for getting th Z-component. Since the coupling process is not likely to produce a detectable Z-component a low geomagnetic latitudes, the occasional presence of the Z-component at low latitudes has beer attributed to the partial reflection and transmission process which may take place at all latitudes The view that the Z-component really corresponds to the left-handed ordinary component suffering reflection at the level corresponding to $p_0^2 = p^2 + p \cdot p_H$ has been supported. *Subject Headings* **1. Triple splitting in ionosphere 2. Ionospheric radio wave reflection.**—*Authors' abstract.* Ⓢ

11F–123 551.510.535:551.594.11

Schmerling, E. R. (*Penn. State Univ.*), **Ionospheric electron densities for Washington, D. C. Panama, Talara and Huancayo, No. 1, July 1957,** Pennsylvania. State Univ. Ionosphere Research Laboratory, Contract AF 19(604)-1304, Scientific Report No. 105, July 15, **1958.** 76 p. 4 figs. 3 refs. Also: **No. 2, Aug. 1957,** *Ibid.*, Scientific Report No. 108, Aug. 1, **1958.** 66 p. 4 figs., 3 refs Also: **No. 3, Sept. 1957,** *Ibid.*, Contract AF 19(604)-3875, Scientific Report No. 111, Sept. 10, **1958** 89 p. 3 figs., 3 refs. (all three almost entirely tables). Also: . . . **for Oct.-Nov.-Dec., 1957,** *Ibid.* Scientific Report No. 118, April 27, **1959.** (Each section separately paged) figs., numerous tables 3 refs. Also: . . . **for April-May-June, 1958,** *Ibid.*, Scientific Report No. 128, Jan. 15, **1960** 83 p. numerous tables, 3 refs. Also: . . . **for July-August-September, 1958.** *Ibid.*, Scientific Report No. 130, March 1, **1960.** 71 p. numerous tables, 3 refs. **DWB** (M10.535 P415i)—The compilation of tables presented were computed from routine ionograms by Budden's matrix method The individual electron-density height profiles for each hour takes full account of the earth's magnetic field neglecting electronic collisions. *Subject Headings:* **1. Ionospheric electron density data 2. Washington, D. C. 3. Panama 4. Talara, Peru 5. Huancayo, Peru. I. Penn. State Univ Ionospheric Research Lab. II. Contract AF 19(604)-1304 III. Contract AF 19(604)-3875.**—*From author's text.*

11F–124 551.510.535:551.594.12

Schmerling, E. R., **Ionospheric electron-density-height profiles.** *American Geophysical Union Transactions*, 39(5):1018–1021, Oct. **1958.** 2 figs. **DWB, DLC**—Studies of the electrically charged region of the atmosphere during the years have been summarized for IGY purposes. During July 1957 a day-to-day study of the electron fluctuations at Talara, Peru, was made and is submitted in this report. *Subject Headings:* **1. Ionospheric electron density 2. IGY ionosphere program.**—*N.N.*

11F–125 551.510.535:551.594.13

Schmerling, E. R. and Ventrice, C. A. (*both, Ionosphere Res. Lab., Penn. State U.*), **Coefficients for the rapid reduction of *h'-f* records to *N-h* profiles without computing aids.** *Journal of Atmospheric*

and Terrestrial Physics, New York, 14(3/4):249–261, June **1959.** 9 figs., 12 tables, 7 refs. **DWB, DLC**—Tables of coefficients are presented by means of which *h'-f* records may be readily reduced to electron-density-height profiles without the use of computing aids. The tables presented are for any station whose magnetic dip angle does not exceed 80°. The ordinary ray trace is utilized. No special assumptions concerning profile shapes are made. Account is taken of the earth's magnetic field, but collisions are neglected. The sensitivity of these coefficients to magnetic dip angle and gyrofrequency is discussed. Sample h'-f records are reduced by means of the coefficients and the results are compared with those from the Budden matrix method. *Subject Heading:* **1. Ionospheric electron density calculations.**—*Authors' abstract.* Ⓢ

11F–126 551.510.535:551.594.12

†Sechrist, C. F., Jr., **Preliminary theory and interpretation of long-wave sweep-frequency records.** Pennsylvania. State Univ. Ionosphere Research Lab., Contract AF 19(694)-3875, Scientific Report, No. 115, Feb. 1, **1959.** 98 p. 44 figs., 35 refs., eqs. **DWB** (M10.535 P415i)—This report being the first of several planned on low frequency ionograms as obtained at the laboratory summarizes the NBS work on low frequency results, the theoretical work and results obtained at the laboratory including qualitative interpretation of some low frequency ionograms. The results as obtained for the stable night Aug. 10–11, 1958 are discussed and the disturbed ones June 9–10 and 10–11, 1958 accompanied by samples of h^1-P records. Results for the stable night showed echoes varying from 100 km at 140 kc/s to 110 km at 1 Mc/s. The approximate 500 kc/s main echo polarization when computed showed up elliptically. Results for the disturbed nights are itemized and in general show the existence of sporadic E-layers at different heights. The normal E-layer ionization was decaying. *Subject Headings:* **1. Ionograms 2. Ionospheric ionization.** —*W.N.* Ⓢ

11F–127 551.510.535:551.594.12

Seddon, J. Carl and Jackson, J. E. (*both, Naval Research Lab., Wash., D. C.*), **Absence of bifurcation in the E-layer.** *Physical Review*, N. Y., 97(4):1182–1183, Feb. 15, **1955.** fig., 8 refs. Also: Pfister, W.; Ulwick, J. C. and Marcou, R. J., **Further remarks on bifurcation in the E-layer.** *Ibid.*, p. 1183–1184. 3 refs. **DLC**—In the first article electron density distribution curves are given covering the altitude range 90–150 km as obtained from three separate New Mexico rocket flights spaced over 5 yrs. Reasons are given for placing considerable confidence in the results. All fail to show any bifurcation in the day-time E-layer, in contradiction of the results of LIEN, MARCOU et al. The second article, a reply to SEDDON and JACKSON, points out that the results of both groups of workers are consistent within themselves but depend on different analyses—SEDDON'S experiments are based on the change in phase delay, while the authors' give the group delay. It is pointed out that the magnetic field has an important effect on the ray paths and adequate allowance for this may affect the results of both experiments. *Subject Headings:* **1. Electron density in E layer 2. E layer bifurcation. I. Pfister, W. II. Ulwick, J. C. III. Marcou, R. J.**—*Physics Abstracts, No.* 5139 *and* 5140, 1955.

11F–128 551.510.535:551.594.12

Seddon, J. C., **Differential absorption in the D and lower-E regions.** *Journal of Geophysical Research*, Wash., D. C., 63(1):209–216, March **1958.** 6 figs., 5 refs., 6 eqs. **DLC**—A method of measuring electron densities in the *D* region making use of the Faraday effect is given. At noon on a day of high absorption, 2,000 el/cc were measured at White Sands Proving Ground, New Mexico, at an altitude of 76 km. The technique also makes possible the determination of the differential absorption, by measuring simultaneously the sum and difference of the amplitudes of the two magneto-ionic components at 7.754 Mc as the rocket rolls. None was found over the range 60 to 88 km. A slow increase then occurred up to 94 km, whereupon it increased very rapidly to a value of ½ per km at 96 km. Experimental difficulties prevented higher altitude measurements. *Subject Headings:* **1. Electron density in D region 2. Electron density measurement techniques 3. Rocket ionospheric data.**—*Author's abstract.*

11F–129 523.75:551.521.64:551.510.535:551.594.12

Shapley, A. H. and Knecht, R. W., **Solar-cosmic effects on Feb. 23–25, 1956 observed by the ionospheric soundings network.** *U. S. National Bureau of Standards, NBS Report*, No. 5596, Aug. 15, **1958.** 11 p. 7 figs., table, 27 refs. **DWB**—Observation of the solar-cosmic effects on the earth pointed sharply to a rise in ionization of the lower ionosphere. Over 18 ionospheric stations were engaged during the Feb. 23 25, 1956 great solar outburst and cosmic ray flux. Echoes were recorded by routine sweep frequency ionosondes and ionospheric effects were detected after 20 minutes of the flare. The geomagnetic pole stations were first affected, then, later, those at lower geomagnetic latitudes down to about 60°. Sub-auroral latitudes experienced the absorption increase at about sunrise as an increment to normal solar-controlled absorption. Stations below 50° geo-

magnetic latitudes were not affected. Absorption varied in the length of time from 40 hours a intraauroral stations to a continued calm activity in some areas until a severe storm set in abrupt 47 hours after the solar flare. Vertical soundings showed also a rise in absorption, caused by th excess solar electromagnetic radiation. Okinawa measurements suggested a flare associated increas of 17% in F2-layer maximum electron density, an effect not apparent at other stations. *Subjec Headings:* **1. Solar flare, Feb. 23, 1956 2. Solar flare effects on cosmic rays 3. Ionospheric ioniza tion.**—*N.N.*

11F–130 551.510.535:551.594.1

Shapley, A. H. and Slutz, Ralph J., **Probing the ionosphere.** *American Geophysical Union Geophysical Monographs*, No. 2:45–48, **1958.** 5 figs., ref. **DLC**—Some of the early results from the IGY network of vertical sounding stations on the time variations of maximum electron density ove individual stations and on regional and global aspects of the ionosphere are presented. Preliminary reports of ionospheric soundings at the South Pole show the existence of a dense F2 layer near the time of the winter solstice and major fluctuations in short periods of time. The mean value of F2 shows significant diurnal variations even though the solar zenith angle is constant. F2 electron densities during the brief winter day at the South Pole compare well with equivalent Northern Hemisphere measurements. No clear reports of simultaneity of occurrence of short-lived aurora phenomena or their ionospheric and geomagnetic counterparts at the North and South Poles are available. Figures showing the Z-component in the echo trails from all layers, graphs giving the ionospheric critical frequencies, etc., are presented and the network studies in the IGY network of vertical sounding stations to delineate latitude profiles etc., is outlined. *Subject Headings:* **1. Ionospheric electron density 2. Ionospheric soundings 3. IGY ionospheric program.**—*I.L.D.*

11F–131 551.511:551.515:551.510.53 551.513.2:551.557.5:551.551.5

Sheppard, P. A. (*Imperial College, London*), **Dynamics of the upper atmosphere.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2116–2121, Dec. **1959.** 4 figs., 8 refs. **DLC**—The mean temperature and motional structure of the stratosphere, mesosphere, and lower ionosphere are described, and the thermodynamics of these regions is considered briefly. Possible disturbances of the mean motion are discussed. It is concluded that vertical convection is a very unlikely cause of such disturbances, that slantwise convection undoubtedly will release potential energy, thus supporting such disturbances, and that small-scale turbulence, though not likely generally, will probably be produced locally (in time and space) in the vicinity of jets in the large-scale baroclinic disturbances. *Subject Headings:* **1. Thermodynamics of disturbances 2. Jet stream turbulence.**—*Author's abstract.* Ⓢ

11F–132 525.6:551.510.535:551.594.12 551.524.73:551.510.535:551.594.12

Shimazaki, Tatsuo (*Radio Research Laboratories, Tokyo*), **Effect of the solar tides and the temperature change in the daily variation in electron density and height of the F2-layer.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, Japan, 6(2):68–82, June **1954.** 7 figs., 12 refs., eqs. **DLC.** Also reprinted as *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(8): following p. 216, April **1955. DWB**—Chapman's ion-production function in an isothermal ionosphere is first reformed for the convenience of applying it to the ionosphere with the temporal variation of temperature. Using this ionization function, the equation of motion and the equation of continuity are solved, taking both the thermal and tidal variations into account. As a result, the maximum electron density and its corresponding height can be obtained for each hour during a day. Departures of these from the norm of the static Chapman region indicate that the behavior of the departure Δn_m is very different from that by Weiss, who deals only with tidal effect on the ionosphere. In our case it is inversely proportional to the temperature variation in the course of a day except in the morning when the electron density is very small. It is also noted that the *semi-diurnal* variation in Δn_m appears even in the case of taking into account only the *diurnal* variation in temperature but not the tidal variation. As regards the behavior of Δh_m, the result similar to Weiss' can be seen, but with the reasonable difference that it is much raised and lowered by thermal expansion and contraction in the afternoon (high temperature) and in the morning (lower temperature), respectively. Further, the effect of temperature variation and tidal one exerted simultaneously on the daily variations in the maximum electron density and its height seem to show the complicated mutual interaction between these two effects. *Subject Headings:* **1. Electron density in F2 region 2. Solar tides 3. Temperature variations 4. F2 layer height variations.**—*Author's abstract.*

11F–133 551.510.535:551.594.12

Shimazaki, Tatsuo, **World-wide daily variations in the height of the maximum electron density of the ionospheric F2 layer.** *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(7):85–97, Jan. **1955.** 7 figs., 2 tables, 8 refs., 14 eqs. **DWB**—A simple formula for obtaining hpF2, the height of the maximum electron density, from (M3000)F2 is first derived after some theoretical

considerations. As the daily variation in hpF2 thus obtained is quite similar to the observed one published at every observatory, the formula is proved to be very useful for obtaining therefrom the daily variation curves of hpF2 for the whole world. Applying the formula to all the observatories of the world, the latitudinal distribution of the daily variation in hpF2 is calculated for all seasons in 1952. From the distribution at middle and higher latitudes we can see a clear enhancement in the daytime of summer, while rather great depression in the daytime of winter, which may suggest the fact that there is a considerable amount of daily variation in temperature in the F2 region, whose magnitude largely depends upon seasons. On the other hand, near the Equator, particularly large enhancement in the daytime can be seen throughout the year. *Subject Headings:* **1. F2 layer height variations 2. Electron density in F2 region.**—*Author's abstract.*

11F–134 551.510.535:551.524.7

Shimazaki, Tatsuo, **The characteristics of the *F2* regions as deduced from the daily variations in the ionospheric layer.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 10(3):124–142, **1956.** 11 figs., 14 refs., 12 eqs. **DWB**—Summarized analytical results of the theoretical work involving two models of the ionosphere are presented and discussed. A general method for analysis of the ionospheric daily variations is demonstrated and some of the salient deductions derived are: 1. The F2 layer is produced at a level higher than that of the maximum electron production as a result of height-dependent coefficient. 2. A positive temperature (or scale height) gradient is a very important factor in the F2 region and the thermal expansion during the daytime is larger in sunspot maximum years than in minimum and in summer and/or lower latitudes than in winter and/or higher latitudes. 3. The vertical drift velocity being nonuniform the increase or decrease of amplitude and phase depend on altitude of formation of the F2 region. Seasonal and latitudinal variations do not depart significantly, from daily variations except near the Equator. *Subject Headings:* **1. Diurnal ionospheric variations 2. F2 layer 3. Ionospheric temperature gradient.**—*W.N.*

11F–135 551.510.535:551.557

Singh, R. N. (*Banaras Hindu Univ., India*) and Khastgir, S. R. (*Univ. College of Science, Calcutta, India*), **Study of "winds" in the F-region of the ionosphere during the unusual days in the IGY-calendar.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):376–383, Nov. **1959.** 5 figs., 4 refs., 8 eqs. **DWB, DLC**—Three-spaced-receiver fading records were taken at Banaras with vertical pulsed transmission at 3.8–4.2 Mc/s during the regular world days, world meteorological intervals following the IGY-calendar and also during the SWI's. The records gave information about the movements of the F region of the ionosphere during these unusual days. The velocity and the direction of the "wind" were obtained by the method of similar fades and the cross-correlation method. The experimental arrangements and the methods of measurements have been described. Usually the velocity of the F region "winds" was found to have high values during the world meteorological intervals. The sudden reversal in the direction of the F region "wind" round the midnight hour was confirmed by the observations taken during the regular world days. The sudden reversal in the direction of the "wind" was found to be followed usually by extremely rapid random fading, indicating turbulence in the ionosphere. The fading records on the unusual days in the IGY-calendar have been classified and fully discussed with reference to the random and steady movements of the irregularities which exist for a short time in the F region. *Subject Headings:* **1. Ionospheric winds 2. Ionospheric movements.**—*Authors' abstract.* Ⓢ

11F–136 551.510.535:550.385

Sinno, Kenzi, **Studies on the disturbances in F2 layer associated with geomagnetic disturbances.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 6(3):120–126, Sept. **1954.** 12 figs., 18 refs. Also in: *Japan. Radio Research Laboratories, Tokyo, Journal*, 2(7):69–76, Jan. **1955.** 12 figs., 7 refs. Also in: *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 9(3):166–173, Sept. **1955.** 12 figs., 7 refs. **DLC, DWB**—The main course of investigation on F2 disturbance, which has been studied by the author for the last three years, is summarized as follows: 1. The separation of variations in f_oF2 and h'F2 associated with geomagnetic storms into 2 parts depending on the universal time and local time, the so-called D_{st}(F2) and S_D(F2), respectively, are clarified. 2. The development process of the F2 disturbance was investigated in respect to each of D_{st}(F2) and S_D(F2). It is concluded that $S_D(f_o\text{F2})$ exists in the earlier stage of geomagnetic storm and $D_{st}(f_o\text{F2})$ grows in the comparatively later stage. 3. The latitudinal and seasonal characteristics were shown. 4. Investigations were made in the behavior of the F2 layer according to the different levels of geomagnetic activities. Results showed that the F2 layer disturbance was generally in proportion to the geomagnetic activities, except for $D_{st}(f_o\text{F2})$ variation in winter. 5. As to the successive yearly variation of ionospheric disturbance, it was found that the phase of S_D(F2) would lag behind according to the decrease of sunspot activity. *Subject Headings:* **1. Ionospheric disturbances 2. F2 layer 3. Geomagnetic disturbances.**—*Author's abstract.*

11F–137 551.510.535:621.396.8

Smith, Ernest K., Jr. (*NBS, Boulder, Colo.*), **Temporal and world-wide variations of sporadic E.** *AGARDograph*, Paris, No. 34:1–22, Sept. **1958.** 15 figs., 4 refs. **DWB** (629.1323 N864a)—This paper attempts to portray the gross geographical and time variations of sporadic *E*. An ionosonde data constitute the only reasonably uniform world wide source of information, the definition of sporadic *E* used here must be the same as that which has been established by international agreement for use in scaling vertical-incidence records. The majority of the data used in this analysis is for the period 1947–1954. Some preliminary analyses of IGY ionosonde data, notably from the closely spaced equatorial chain in South America, are also included. It is left to other papers in this meeting to distinguish between the different types of *Es*. Further, an arbitrary choice is made to consider only such cases of sporadic *E* for which the vertical incidence critical frequency (*fEs*) is greater than 5 Mc/s. Temporal and geographic variations are represented by contour maps for which the contour parameter is the percentage of time for which *fEs* exceeds 5 Mc/s. Three sporadic *E* zones, equatorial, temperate and auroral, are established on the basis of the diurnal and seasonal variations of the gross sporadic *E*. The boundary between the auroral zone and the temperate zone is found to occur near the 15% auroral isochasm. The equatorial zone is taken to be a narrow ribbon centered on the magnetic equator and connected with the equatorial electrojet. The most recent data available indicates that this ribbon is about four hundred miles in width. *Subject Headings:* **1. Ionospheric scattering 2. Sporadic E layer (Es) variations 3. IGY ionosphere program.**—*Author's abstract.*

11F–138 551.510.535:621.396.8

Smith, E. K., Jr. (*NBS, Boulder, Colorado*), **Sporadic *E* observed on VHF oblique-incidence circuits.** *AGARDograph*, Paris, No. 34:129–146, Sept. **1958.** 11 figs., 8 refs. **DWB** (629.1323 N864a)—This paper is concerned with sporadic *E* as observed on VHF circuits operated by the Nat. Bureau of Standards. The only circuit for which extensive analyses are available is the initial ionospheric scatter circuit running from Cedar Rapids, Iowa, to Sterling, Va. in the U. S., and operating at 27.775 and 49.8 Mc/s with high gain rhombic antennas. During the last year, observations have also been made over three frequency yagi to yagi circuits (30, 50, and 74 Mc/s) and four frequency rhombic to rhombic circuits (30, 40, 50, 74), all circuits having their transmitters in Long Branch, Ill., and their receivers on Table Mesa, near Boulder, Colo. Another series of circuits operating on 50 Mc/s extend from Guantanamo Bay, Cuba, down across the magnetic equator in South America. A companion circuit to this later series runs from the northern part of Luzon in the Philippines to Okinawa in the Ryukyu Islands. Preliminary observations are presented for some of these circuits. A rather crude but simple method is shown by which it is possible to predict VHF field strength levels from vertical incidence data. Simultaneous fading rate measurements made on 30, 50 and 74 Mc/s over the Long Branch to Boulder path indicate that fading during sporadic *E* normally has a period of a few seconds. However, it is not uncommon for fading on 30 Mc/s to be more rapid than on 50 Mc/s, and 50 Mc/s to be more rapid than 74 Mc/s. Results such as these seem to point towards a mechanism where intense patches of ionization occur in the *E* region and reflections take place when plasma densities pertinent to the frequency and obliquity in question occur. When referred to the inverse distance level, signal strengths during periods of sporadic-*E* propagation appear about 10 dB higher on 5 element yagi antennas than on high gain rhombics. *Subject Headings:* **1. Sporadic *E* layer (*Es*) scatter 2. Ionospheric radio wave propagation.**—*Author's abstract.*

11F–139 551.510.535:551.594.12

Smith-Rose, R. L. (*Radio Res. Station, Ditton Park, England*), **Electron density profiles in the ionosphere during the I.G.Y.** *Journal of Geophysical Research*, Wash., D. C., 63(3):570–572, Sept. **1958.** 2 tables. **DLC**—During the I.G.Y. four observatories under the British regularly measured the maximum electron density and the approximate true height (*hm*) of the various layers in the ionosphere. An electron density profile of one of these stations, Port Stanley, 51°42′S, 57°51′W for July 2–7, 1957, is given. *Subject Headings:* **1. Ionospheric electron density 2. IGY ionospheric program.**—*N.N.*

11F–140 551.507.362.2:551.510.535:538.69:537.563

Sorensen, E. V., **Magneto-ionic Faraday rotation of the radio signals on 40 Mc/s from Satellite 1957 (Sputnik I).** (Abstract of article issued by Danish Academy of Technical Sciences, Microwave Laboratory, Copenhagen, as its *Report* P 1765, June 24, **1959**).—Some of the fadings of the 40 Mc/s signals from Sputnik I during morning transits are assumed to originate in Faraday rotation in the ionosphere. This has been investigated for the transit of Oct. 12, 1957, 5.30 GMT, for which the orbit was known with reasonable accuracy. The fading records show an increasing fading rate during the last part of the transit. This is contrary to the simple theory based on the assumptions of a flat earth and a homogeneous ionosphere, from which a constant fading rate should be expected.

The main reason why simple theory did not apply in this case, is that the satellite travels through the twilight zone from night towards day, i.e., from low to high ionization. The Faraday rotation is calculated by means of data for the orbit, magnetic field maps and predictions of the ionosphere conditions. The result is in good agreement with the observation when a high ionization between the altitude of maximum ionization and the satellite is assumed. The effect of refraction is estimated by means of the perturbation theory. It increases the Faraday rotation from 0 to 19% during the transit. It is concluded that it is difficult to obtain detailed information on the state of the ionosphere by means of such fading records, especially when the frequency is so low that the refraction becomes significant. *Subject Headings:* **1. Satellite ionospheric observations 2. Soviet satellite investigations.**—*Author's summary.* Ⓢ

11F–141 551.507.362.2:551.510.535:551.594.12

Storey, L. R. O., **A method for measuring local electron density from an artificial satellite.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 63(3):325–340, Nov./Dec. **1959.** 11 figs., table, 14 refs., 51 eqs. **DWB, DLC**—A method is proposed for measuring the electron density at known points in the outer ionosphere, by the use of VLF receiving equipment in an artificial satellite, in conjunction with a VLF transmitter on the ground. The transmitter would radiate continuous waves, which would be propagated through the ionosphere in the "whistler" mode. The basis of the method is a measurement of the local wave admittance of the medium, by comparison of the signals received on an electric dipole and on a loop. A further proposal is made for an integrated VLF satellite experiment, in which several different types of observation would be made simultaneously. *Subject Headings:* **1. Ionospheric electron density measurement techniques 2. Satellite ionospheric observations.**—*Author's abstract.* Ⓢ

11F–142 551.510.535

Storey, L. R. O. (*Nat. Center of Scien. Res. Paris*), **The joint use of the ordinary and extraordinary virtual height curves in determining ionospheric layer profiles.** *U. S. National Bureau of Standards, Journal of Research, Sec. D*, 64(2):111–124, March/April **1960.** 5 figs., table, 12 refs., 74 eqs. **DWB, DLC**—An extension of Budden's matrix method for determining ionospheric layer profiles is described. When analyzing vertical incidence ionograms by the matrix method, it is usual to interpret the virtual height curve for the ordinary mode only. Errors then arise from the presence in the lower ionosphere of low density ionization for which the plasma frequency is less than the lowest frequency observed. In the proposed extension of the method, such errors are reduced by making use of the extraordinary virtual height curve as well as of the ordinary. *Subject Heading:* **1. Ionospheric data analysis.**—*Author's abstract.* Ⓢ

11F–143 551.510.535

Thomas, J. A. and Svenson, A. C. (*both, Physics Dept., Univ. of Queensland, Brisbane*), **Lunar tide in sporadic E at Brisbane.** *Australian Journal of Physics*, Melbourne, 8(4):554–556, Dec. **1955.** 2 figs., 2 tables, 2 refs. **DLC**—Measurements of virtual height of radio echoes from E region were made at Brisbane with a pulse transmitter at 2.228 Mc/s and recordings were made in range from 80 to 150 km, from Dec. 1952 to Nov. 1953. Both E and Es layers are included but a harmonic analysis of nighttime readings (taken every 6 minutes) consisting mostly of Es reflections, shows limit of accuracy of measurements and amplitude and phase of lunar semidiurnal tide (0.14 to 2.96 km, and 2.8 to 11.4 hours for monthly means). Comparison of annual averages obtained by Matsushita (May 1951–Apr. 1952), the authors (Dec. 1952–Nov. 1953), and Martyn (June 1943–Dec. 1947) shows range from 0.5 to 0.7 km and 4.5 to 6.7 hours. Height measurements to an accuracy of >0.5 km are of little use. *Subject Headings:* **1. Annual sporadic E layer (Es) variations 2. Atmospheric tides 3. Brisbane, Australia.**—*M.R.*

11F–144 551.510.535:551.508.96

Thomas, J. A.; Svenson, A. C. and Brown, H. E. (*Univ. of Queensland, Brisbane*), **Ionospheric recorders and sporadic E.** *Australian Journal of Physics*, Melbourne, 9(1):159–161, March **1956.** 2 figs., plate, 4 refs. Also: Thomas, J. A.; Brown, H. E. and Cairns, G. G., **A further note on ionospheric recorders and sporadic E.** *Ibid.*, 10(2):310–311, June **1957.** fig., 3 refs. **DLC**—Repetitive sequences of records of Es frequency were made with different receiver gains (every 2 minutes) showing that fEs and f_bEs values are reliable for stations in mid latitudes. Marked variations in Es between stations may then be due to varying nature of the Es itself, and not as suggested by Rawer (1949), Booker (1950) and McNicol and Gipps (1951), due to variations in the sensitivity of the recording equipment. Graphs and recorder records show no dependence of fEs on receiver sensitivity up to at least 6dB above normal recording sensitivity. *Subject Headings:* **1. Sporadic E layer (Es) recording 2. Ionospheric recorders.**—*M.R.*

11F–145 551.510.535

†Thomas, J. A., **Sporadic E at Brisbane.** *Australian Journal of Physics*, Melbourne, 9(2):228–246, June **1956.** 19 figs. (incl. photos), table, 28 refs. **DLC**—Further data are presented in support of McNicol and Gipps' classification of two types of sporadic E at Brisbane (lat. 27.5°S), namely sequential type (Ess) and constant height type (Esc). Information is given on the occurrence, critical and blanketing frequencies, reflection coefficients, range spreading, vertical movements, and lateral extent of Es patches. No correlation is found with sunspot cycle, meteor occurrence, or thunderstorm activity. Scattering from a turbulent medium is not responsible for Esc at Brisbane. Tidal movement is regarded as most likely cause of both types of Es. *Subject Headings:* **1. Sporadic E layer (Es) types 2. Brisbane, Australia.**—*Author's abstract.*

11F–146 551.510.535

Thomas, J. A., **Double-layer phenomena in the Es region.** *Australian Journal of Physics*, Melbourne, 9(4):575–577, Dec. **1956.** 8 figs., 4 refs. **DLC**—Six ionospheric *P'f* and *P't* (2.28 Mc) records are presented for Brisbane, and models sketched to show how a multiple layer effect could be produced by a sloping Es layer. It is presumed that the moving Es layer could be made up to an aggregate of disk like clouds with sloping regions of the order of those postulated. Large sloping regions necessary to produce high multiple Es echoes similar to F layer echoes are rare (over a two year period) and even doubtful existence. (*See* Thomas and Burke, 1956.) *Subject Headings:* **1. Multiple Sporadic E layer (Es) 2. Sporadic E layer (Es) structure 3. Brisbane, Australia.**—*M.R.*

11F–147 551.510.535:551.594.13

Thomas, J. O. and Robbins, Audrey (*both, Cavendish Lab., Cambridge*), **Ionospheric true height and M.U.F. calculations.** *Journal of Atmospheric and Terrestrial Physics*, London, 12(1):77–79, **1958.** 2 tables, 9 refs. **DLC**—A recent investigation resulted in new and more accurate determinations of the electron density distribution in the ionosphere over Slough, England (51.5°N, 0.5°W). It is now known that the larger deviations from the predicted values of M.U.F. occur in summer and in sunspot minimum years, the predicted M.U.F. being too low. In this paper, the original M.U.F. calculated for north-south transmission of the ordinary ray has been modified by taking into account the effects of the earth's magnetic field. *Subject Headings:* **1. Ionospheric forecasts 2. Ionospheric electron density distribution.**—*N.N.*

11F–148 551.570.535:621.396.1

Wait, James R. (*Nat. Bureau of Stands., Boulder, Colo.*), **Diurnal change of ionospheric heights deduced from phase velocity measurements at VLF.** *Institute of Radio Engineers, N. Y., Proceedings*, 47(5, Pt. 1):998, May **1959.** 11 refs., 6 eqs. **DWB**—This is a review of some previous work by Pierce and Crombie as reported in *Nature*, Vol. 177, p. 178–179, Jan. 28, 1956, on the variation of the phase of VLF waves propagated over great distances. The present report discusses the experimental data of Pierce and Crombie from the viewpoint of the mode theory of VLF propagation. The author objects to any analytical presentation which supports the idea that ionospheric reflection coefficient remains the same for day and night *Subject Headings:* **1. Ionospheric height determination 2. Ionospheric VLF propagation studies.**—*N.N.* Ⓢ

11F–149 551.510.535:621.396.6

Warwick, James W. and Zirin, Harold, **Research carried out Oct. 1–Dec. 31, 1956 (at the High Altitude Observatory).** Colorado. Univ. High Altitude Observatory, Climax, Contract AF 19(604)-1491, Scientific Report, No. 6, April 1, **1957.** 6 p. 2 figs., 9 refs., 7 eqs. **DWB** (M10.535 C719s)—Construction of the 18 Mc/s wide-angle interferometer continues through the report period. The antenna superstructures were essentially completed, in unassembled form, receiver tests on Ewen-Knight Radio Astronomy Receiver Model 1620 continued, but were not completed during the period. In view of the incomplete status of the equipment, we decided to devote time to analysis of the records from the IGY Radio Flare Detector, constructed at HAO with funds from another source. The records show the intensity of cosmic noise (at 18 Mc/s) vertically incident through the ionosphere. We are able to derive from these records the march of electron density as a function of time of day and height in the D region. Surprisingly, we also can discuss the variation of recombination coefficient within a limited height range of the D region. The electron density curves fit, more or less, those derived in different ways by other groups. On the other hand, we predict that the recombination coefficient either is constant with height (in the D region), or increases upwards. *Subject Headings:* **1. Interferometers 2. Electron density in D region.**—*Authors' abstract.*

11F–150 551.510.535:621.396

Warwick, James W., **Measures of ionospheric absorption and refraction at 18 megacycles/second.** Colorado. Univ. High Altitude Observatory, Contract AF 19(604)-1491, Final Report, Dec. 15, **1958.** 9 p. 2 figs., 10 refs. **DWB** (M10.535 C719s)—Ionospheric absorption and re-

fraction at a frequency of 18 Mc/s has been measured by means of the techniques of radio astronomy. A description of the two experiment techniques used is given in this report. *Subject Headings:* **1. Ionospheric absorption 2. Ionospheric radio wave refraction 3. Radioastronomic measurements.** —*N.N.*

11F–151 551.510.535

†Watanabe, Kenichi; Marmo, F. F. and Pressman, Jerome, **Formation of the lower ionosphere.** *Journal of Geophysical Research*, Wash., D. C., 60(4):513–519, Dec. **1955.** fig., 5 eqs., 37 refs. **DLC**—According to new absorption data on O_2 and N_2 in the spectral region 850–1100A, photoionization of atmospheric O_2 at its first ionization potential should occur in the E layer rather than the D layer. In particular, Lyman beta in the solar spectrum is expected to be an important line, as it can ionize O_2 while it is quite transparent to N_2. A flux of about 10^9 photons cm^{-2} sec^{-1} for this line can account for the lower E layer, while the higher region may be in part ascribed to an observed preionization of the Hopfield bands. Thus, it is not possible yet to reject the oxygen theory in favor of the x-ray theory of the E layer. *Subject Headings:* **1. Ionosphere formation 2. E layer 3. Ionospheric absorption.**—*Authors' abstract.*

11F–152 551.510.535:551.506.7

Watts, J. M. (*Nat. Bur. of Stand., Boulder, Colo.*), **Complete night of vertical-incidence ionosphere soundings covering frequency range from 50 Kc/s to 25 Mc/s.** *Journal of Geophysical Research*, Wash., D. C., 62(3):484–485, Sept. **1957.** photo. **DLC**—A presentation of ionospheric sounding records for each half hour from 1730 MST to 0730 MST for one complete night, covering the entire range of frequencies from <100 Kc to >25 Mc/s. The composite records are made by joining a 2 Mc/s record made with a Model C-4 recorder at Boulder to a simultaneous record made with a low frequency recorder at Sunset Field Station 15 mi. away. Series shows sunset and sunrise effects during moderately disturbed conditions. *Subject Heading:* **1. Ionospheric soundings.**—*M.R.*

11F–153 551.510.535

Watts, J. M., **The interpretation of night-time low-frequency ionograms.** *Journal of Geophysical Research*, Wash., D. C., 63(4, Pt. 1):717–726, Dec. **1958.** 6 figs., 4 refs., eqs. **DWB, DLC**—Two types of retardation of the extraordinary ray on passing through a region whose critical frequency is below the gyro-frequency are discussed. On a sweep-frequency basis, one is observed near the critical frequency of the ordinary ray and the other appears near the gyro-frequency. Observations of either require near transparency of the lower E region during the night, but information as to the total number and distribution of electrons below the F layer can be deduced from them. *Subject Heading:* **1. Ionograms.**—*Author's abstract.*

11F–154 551.510.535:551.507.362.2

Webster, H. C. (*Physics Dept., Univ. Queensland, Brisbane*), **A study of "spread-F" ionospheric echoes at night at Brisbane, Pt. 4, Range spreading.** *Australian Journal of Physics*, Melbourne, 11(3):322–337, Sept. **1958.** 10 figs., 8 refs., 20 eqs. **DLC**—In the course of investigations of satellite echoes from the F region of the ionosphere, it was noted that F and Es traces recorded at night, on *h't* equipment at frequencies well below vertical, are broader than anticipated and tend to change in a characteristic manner as the gain of the receiver is lowered. In this paper, a quantitative explanation of these phenomena is elaborated, based on the postulate of a "rough" ionosphere. This theory leads to a method whereby, from the swept-gain *h't* records, estimates of roughness index can be formed. These estimates compare satisfactorily, on a statistical basis, with estimates by other methods. The theory is extended to the case of multiple-hop reflections, and to the satellite traces; general agreement with experiment is found. Evidence is presented that the ionosphere appears rougher when transmitter and receiver are adjacent than when they are widely separated, and a tentative explanation is suggested. From the roughness indices, the relative intensities of Z- and O- mode F echoes for Brisbane are computed and the rare appearance of Z-traces on Brisbane records is satisfactorily explained. *Subject Headings:* **1. Ionospheric echoes 2. Spread F variations 3. Ionospheric observations with satellites.**—*Author's abstract.*

11F–155 551.501.75:551.557:551.510.535

Wells, Harry W., **Upper atmospheric winds, absorption and other special projects in the U. S. Program in Ionospheric Physics.** *American Geophysical Union, Geophysical Monographs*, No. 2:49–54, **1958.** 4 figs. **DLC**—The possible mechanism for the formation of the ionospheric layers and auroras under the influence of solar activity and the importance of the absorption layers produced either by solar disturbances or by particle bombardment in the study of solar terrestrial relationships are discussed. At the Univ. of Alaska the ionospheric absorption apparatus utilizes the "cosmic noise method"; the relative ionospheric opacity is measured; the instrument is termed a riometer. At Pennsylvania State University a short pulse is transmitted vertically and the intensity of the

reflected signal or echo is recorded. The present state of knowledge on winds and drifts in the upp atmosphere is reviewed. The meteor-Doppler methods show drift velocities between 100 and 20 mi/hour. There are large semidiurnal components and the drift direction rotates clockwise wit time in the Northern Hemisphere and counterclockwise in the Southern Hemisphere. Heights a limited to meteor levels corresponding to the E-layer of the ionosphere at 60 to 70 mi. Rad fading methods in the E-layer give similar results. Radio scintillation establishes that simil clouds or patches of electrons are swept through the upper atmosphere at velocities of 200 to 3 mi/hr, at heights of about 300 mi above the earth. The method of wind measurement by scintillatic methods, the installation at the University of Puerto Rico under the sponsorship of the Geophysi Research Directorate, the program of radio propagation under unusual conditions also sponsore by the Geophysics Research Directorate, and the work on true height determinations at Pennsylvan State Univ. are discussed. *Subject Headings:* **1. Upper air wind measurement techniques 2. Ion spheric radio wave propagation 3. Ionospheric drift velocities.**—*I.L.D.*

11F–156 551.510.535:551.594.1

Whitehead, J. D. (*Otago Univ., Dunedin, N. Z.*), **Sudden changes in the virtual height of radi waves reflected from the E-region of the ionosphere.** *Journal of Atmospheric and Terrestrial Physic* N. Y., 16(1/2):99–102, Oct. **1959.** fig., 5 refs., eqs. **DWB, DLC**—It has been observed that th virtual height of radio waves reflected from the E region shows discontinuous changes. The lowe height reflections take place from thin layers within the normal E region. From the measurement of the associated amplitude changes, it has been possible to deduce that the electronic collisio frequency at 110 ± 5 km is $(1.3 \pm 0.1) \times 10^4$ per sec and the semi-thickness of the thin layers is 4 ± 2 km *Subject Headings:* **1. Ionospheric radio wave reflection 2. E layer reflection 3. Electron collision frequencies.**—*Author's abstract.* Ⓢ

11F–157 551.510.535:551.594.11

Whitehead, J. D., **The absorption of short radio waves in the D-, E- and F-regions of the ionos sphere.** *Journal of Atmospheric and Terrestrial Physics*, N. Y., 16(3/4):283–290, Nov. **1959.** 6 figs. 16 refs. **DWB, DLC**—The published values of the noon absorption of radio waves of frequencie 2, 2.4, 4 and 4.8 Mc/s measured at Slough from 1947 to 1953 have been analyzed. From the ab sorptions of 2 and 2.4 Mc/s waves, it has been deduced that (a) the electronic collision frequency at the height of the maximum electron density in the E region when the sun's rays are inciden vertically on the ionosphere, is $(1.9 \pm 0.1) \times 10^4$ per sec; and (b) the normal absorption in the D region increases with increasing sunspot number, whereas the additional absorption which occurs o certain winter days and arises in the D region may decrease with increasing sunspot number. The 4 and 4.8 Mc/s waves were reflected from the F region at noon. The absorption in the F region is calculated from the known total absorption and the calculated absorption in the D and E regions The collision frequency in the F region may then be found. At the height of reflection of 4 Mc/s waves (150 to 180 km) it is $(3.6 \pm 0.6) \times 10^3$ per sec, and at the height of reflection of 4.8 Mc/s waves (180 to 200 km) it is $(3.0 \pm 0.6) \times 10^3$ per sec. The significance of these results is discussed. *Subject Headings:* **1. Ionospheric absorption calculation 2. Electron collision frequencies.**—*Author's abstract.* Ⓢ

11F–158 551.510.535:551.593.12:523.164.42

Wright, R. W. H. (*Univ. College of Ghana, Achimota, Ghana*), **Geomorphology of spread F and characteristics of equatorial spread F.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2203–2207, Dec. **1959.** 5 figs. **DLC**—Between magnetic latitudes 20°N and 20°S there is a well-defined region where spread F is a normal occurrence on magnetically quiet days. Equatorial spread F is a night-time phenomenon that begins between 1900 and 2200 by a characteristic doubling of the layer and an increase in virtual height, indicating a vertical velocity. Later in the night, after 2300, the records show group retardation and no stratification. The occurrence of equatorial spread F is decreased by magnetic activity. Radio-star scintillations in equatorial regions are correlated strongly with spread F and have the same diurnal variation and the same anticorrelation with magnetic activity. The phenomenon of 'flutter' (rapid fading of long-distance, high-frequency stations) shows the same variations. Measurements using the spaced receiver method indicate that, in the equatorial region, the irregularities in the F layer are greatly elongated along the lines of the earth's magnetic field. *Subject Headings:* **1. Spread F 2. Radio star scintillation.**—*Author's abstract.* Ⓢ

11F–159 551.507.362.2:551.506.7:551.510.535

Yeh, K. C. and Senson, G. W., Jr. (*both, Univ. of Illinois, Urbana, Ill.*), **The scintillation of radio signals from satellites.** *Journal of Geophysical Research*, Wash., D. C., 64(12):2281–2286, Dec. **1959.** 6 figs., 8 refs. **DLC**—Signals from satellites $1957\alpha_2$ and $1958\alpha_2$, recorded during a 20-month period, are analyzed to determine the diurnal and seasonal variations of the incidence of scintillation. Marked diurnal effects are noted, scintillation being much more frequent at night.

Night-time scintillation correlates with the occurrence of ionospheric 'spread F' and apparently originates in inhomogeneities at heights of about 220 km and, in most cases, at latitudes greater than 40°N. Daytime scintillation appears to originate in smaller, inhomogeneous regions below 220 km and more widely distributed in latitude. *Subject Headings:* **1. Satellite ionospheric observations 2. Spread F.**—*Author's abstract.* Ⓢ

11F–160 551.510.535:551.594.13

†Yonezawa, T., **A consideration of the mechanism of electron removal in the F2 layer of the ionosphere, Pt. 2.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere Research in Japan*, 9(1):17–37, March **1955.** 2 figs., 3 tables, 49 refs., 54 eqs. **DWB, DLC**—Theoretical considerations on the mechanism of electron removal in the F2 region have been made. The main observational facts hitherto obtained from the analysis of data can be summarized into three items: (1) The temporal rate of electron disappearance is of the attachment type. (2) The value of the attachment coefficient is about 10^{-4} sec^{-1} at the 300 km level. (3) The values of the scale height associated with the decrease in the attachment coefficient with height are roughly 100 km. The most probable mechanism of electron removal, which consists of the charge transfer reaction between atomic ions of oxygen and neutral molecules of oxygen or excited nitrogen followed by the dissociative recombination between the resulting molecular ions and electrons, is examined to see whether it can well interpret these observational facts. It is concluded that there is at present no satisfactory theory of the electron removal in the F2 region which can yield a consistent picture of its mechanism. (For Pt. 1, *see* 6E–147, May 1955, *Met. Abstracts.*) *Subject Heading:* **1. Ionospheric electron removal.**—*Author's abstract.*

PART III. TRANSLATIONS, RECENT MONOGRAPHS AND ANALYTICS FROM SERIALS AND COLLECTED WORKS

Note: Material listed in these sections will not be included in the monthly indexes until abstracted. The item number is mentioned for those titles which have been abstracted in previous issues of *Meteorological Abstracts*.

A. TRANSLATIONS

Caribbean Hurricane Seminar, Ciudad Trujillo, Feb. 1956: **Final Report of the Seminar.** Issued Ciudad Trujillo, 1956. 401 p. figs., etc. Spanish version issued Ciudad Trujillo, 1957, with title **Seminario sobre los huracanes del Caribe. . . .** 409 p. DLC (QC945.C32 1956) (*For abstract on English version, see* 11.6–23, this issue of *Met. Abstracts*)

Egorov, V. A.: **Determination of the true anomaly in perturbed motion.** (Transl. of original Russian in *Astronomicheskiĭ Zhurnal*, Moscow, 35(1):166–168, 1958.) Transl. issued as *Canada. Defence Research Board, Translation* T-291-R, May 1958. 4 p. 4 refs., numerous eqs. Available DWB

Krasovskiĭ, V. I.: **Exploration of the upper atmosphere by the help of the third Soviet artificial Earth satellite.** (Transl. of the original Russian, **Issledovanie verkhneĭ atmosfery pri pomoshchi tret'ego iskusstvennogo sputnika Zemli,** in *Priroda*, Moscow, No. 12:71–78, Dec. 1958. 6 figs.) Transl. issued in *International Astronautical Congress, Amsterdam, Aug. 1958, Proceedings*; Vol. 2:614–625, issued 1959. 9 figs., eqs. Available DLC (TL787.I44)

Omshanskiĭ, M. A.: **Evolution of effective synoptic weather forecasting.** (Transl. of original Russian, **Evoliutsiia uspeshnosti sinopticheskikh prognozov pogody,** in *Akademiia Nauk SSSR, Izvestiia, Ser. Geog. i Geofiz.*, No. 3:161–172, 1943. 9 tables, 13 refs.) Transl. by Alexander G. Alexeeff issued as *U. S. Air Force, Library Translation* No. 285. 25 p. Transl. available DWB (MO9.5: O56)

Shklovskiĭ, I. S.: **Cosmic radio waves.** (Transl. of original Russian, **Kosmicheskoe radioizluchenie,** pub. Moscow, 1956. 492 p. 167 figs. (incl. photos), tables, numerous refs., eqs.) Transl. by Richard B. Rodman and C. M. Varsavsky, issued Cambridge, Mass., Harvard Univ. Press, 1960. 444 p. 205 figs., tables, bibliog., eqs. (*For abstract on original Russian, see* 11.6–140, this issue *Met. Abstracts*)

Yamamoto, Takeo: **Secular variation of summer rainfall in the Far East.** (Transl. of original Japanese in *Kagaku* (Science), 22(2):96, 1952.) Transl. issued as *Canada. Defence Research Board, Translation* T-66-J, March 1959. 4 p. 3 figs., 7 refs. Transl. available DWB

B. RECENT MONOGRAPHS

Bollinger's Atlas of Planetary Solar Climate, with sun-tide indices of solar radiation and global insolation. Pub. by Battenburg Press, Norman, Oklahoma. 7 planet (8 day interval) sun-tide indices, 1900–1959, price $6.00. 7 planet (5 day interval) suntide indices, 1960, price $1.00

Borisov, A. A.: **Klimaty SSSR** [Climate of the U.S.S.R.]. Issued Moscow, Uchpedgiz., 1959. About 273 p. Review by A. M. Alpat'ev in *Meteorologiia i Gidrologiia*, No. 6:45–46, June 1960.

Brazil. Conselho Nacional de Geografia [and] Brazil. Serviço de Meteorologia: **Atlas Climatológico do Brasil, Vol. 3, Indices Climáticos.** Rio de Janeiro, 1960. 2 vol. (text and charts). 37×36 cm. (*For abstract on Vol. 1, see* 7.7–9, July 1956; *Vol. 2, see* 8.9–14, Sept. 1957, *Met. Abstracts*)

Cowen, Robert C.: **Frontiers of the sea: the story of oceanographic exploration.** Introd. by R. R. Revelle. Garden City, N. Y., Doubleday, 1960. 307 p. figs., photos, bibliog. Price $4.95 DLC (GC11.C65)

Eckart, Carl: **Hydrodynamics of oceans and atmospheres.** N. Y., Pergamon Press, 1960. 304 p. illus. Price $9.00 DLC

Keller, R.: **Der mittlere Niederschlag in den Flussgebieten der Bundesrepublik Deutschland** [Average rainfall in the river basins of the German Federal Republic]. *Forschungen zur*

Deutschen Landeskunde, Vol. 103, issued Remagen/Rhein, 1958. 81 p. 3 maps and tables in Appendix. Review by F. Lauscher in *Wetter und Leben*, 12(3/4):84, 1960.

Kutterer, R. E.: **Ballistik** [Ballistics]. 3d ed. Braunschweig, Vieweg, 1959. 304 p. figs., tables. Price DM 38.—Review by E. Roth-Desmeules in *Zeitschrift für Angewandte Mathematik und Physik*, Basel, 10(6):611, 1959.

Midwestern Conference on Fluid Mechanics, 6th, Univ. of Texas, Austin, Sept. 1959, **Proceedings** [including 30 papers of the Conference]. 465 p. Price $12.50

Ratcliffe, J. A. (*ed.*): **Physics of the upper atmosphere.** N. Y., Academic Press, 1960. 586 p. Illus. Price $14.50. DLC (QC879.R35)

Sauberer, Frans and Härtel, Otto: **Pflanze und Strahlung** [Plants and radiation]. Leipzig, Geest & Portig, 1959. 268 p. figs., tables, bibliog. (*Probleme der Bioklimatologie*, Vol. 5) DWB (M21.1 S255pf)

Waldheuser, Harry William: **Approach to using prognostic charts in precipitation forecasting.** 1957. 48 p. figs., tables, refs. Thesis (Ms. Sci.)-St. Louis Univ. DWB (M09.324 W163ap)

C. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Acta Hydrophysica, Berlin, Vol. 6, No. 1, 1959

Griesseier, Helmut: **Über die Verwendung von Luminoforen beim Studium der litoralen Materialbewegungen,** [Use of luminous tracers for the study of the movement of coastal materials], p. 5–42

Fischer, Johannes: **Über nomographische Verfahren in der Hydrographie, Teil III,** [Nomographic methods in hydrography, Pt. 3], p. 43–60

Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz., No. 1, Jan. 1960

Liustikh, E. N.: **O konvektsii v zemnoĭ obolochke,** [Convection in the earth's crust], p. 3–6

Gol'tsman, F. M.: **Chastotnaia teoriia interferentsionnykh sistem. I,** [Frequency theory of interferential systems, Pt. 1], p. 7–23

Zverev, S. M.: **Dinamicheskie osobennosti mnogokratno-otrazhennykh vodnykh voln v okeane i ispol'zovanie ikh dlia opredeleniia skorosteĭ uprugikh voln v osadkakh,** [Dynamic characteristics of multiple reflected water waves in the ocean and their use in determining the speed of elastic waves in sediments], p. 24–36

Pospelova, G. A.: **Prichiny obratnoĭ namagnichennosti vulkanogennykh porod Armenii i Kuril'skikh ostrovov,** [Causes of the reverse magnetization of volcanogenic deposits in Armenia and in the Kuril Islands], p. 37–49

Kalashnikov, A. G. and Mokhova, E. N.: **O variatsiiakh regional'nogo elektromagnitnogo polia malogo perioda,** [Variations in the regional electromagnetic low-period field], p. 50–54

Parkhomenko, E. I.: **Issledovaniia triboelektricheskogo effekta gornykh porod i nekotorykh dielektrikov dinamicheskim metodom,** [Investigations of the triboelectric effect of rocks and certain dielectrics by dynamic methods], p. 55–62

Miachkin, V. I. and Solov'eva, R. P.: **Izuchenie rasprostraneniia uprugikh voln ul'trazvukovoĭ chastoty na malykh bazakh v gornykh porodakh v usloviiakh estestvennogo zaleganiia,** [Study in situ of the propagation of elastic waves of ultrasonic frequency in rock at small stations], p. 63–73

Kamenkovich, V. M.: **O kvazistatsionarnosti dreĭfovykh techeniĭ v okeane,** [Quasistationary drift currents in the ocean], p. 74–82

Matveev, L. T.: **K ustanovleniiu zavisimosti koeffitsienta turbulentnosti ot vysoty v prizemnom sloe atmosfery,** [Establishment of the dependence of the turbulence coefficient on height in the air layer near the ground], p. 83–88

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Dergach, A. L.; Zabrodskiĭ, G. M. and Morachevskiĭ, V. G.: **Opyt kompleksnogo issledovaniia oblakov tipa St—Sc i tumanov v Arktike,** [Experiment on a complex investigation of St and Sc clouds and fog in the Arctic], p. 107–114

Svetov, B. S.: **Nekotorye rezul'taty model'nykh issledovaniĭ po induktivnomu metodu,** [Certai results of model investigations by the induction method], p. 115–125

Glivenko, E. V.: **Ob obmennykh i otrazhennykh volnakh na azimutal'nykh seĭsmogrammak zemletriaseniĭ Garmskoĭ oblasti,** [Interchanging and reflected waves on azimuthal seismo grams of earthquakes in the Garm region], p. 126–130

Ulomov, V. I.: **Nekotorye osobennosti stroeniia zemnoĭ kory Sredneĭ Azii po zapisiam moshn chnogo vzryva,** [Certain structural characteristics of the earth's crust in Central Asi according to records of a strong explosion], p. 131–134

Savarenskiĭ, E. F. and Meĭ, Shi-Yun: **Po povodu otsenki intensivnosti zemletriaseniĭ na terri torii Kitaia,** [Evaluation of the intensity of earthquakes in China], p. 135–138

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Dianov-Klokov, V. I.: **Izmeritel' maloĭ ostatochnoĭ namagnichennosti gornykh porod,** [Mete for measuring small amounts of residual magnetization], p. 142–147

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Shamina, O. G.: **Zavisimost' zatukhaniia impul'sov v sloiakh konechnoĭ tolshchiny ot chastot nykh spektrov,** [Dependence of the attenuation of impulses in layers of finite thickness on spectral frequency], p. 151–154

Barsukov, O. M.: **K voprosu o trekh "skorostiakh" korpuskuliarnykh potokov,** [Problem of the three speeds of corpuscular currents], p. 155–157

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Kazanskiĭ, A. B. and Monin, A. S.: **O turbulentnom rezhime vyshe prizemnogo sloia vozdukha,** [The regime of turbulence above the air layer near the ground], p. 165–168

Borisova, S. V. and Burman, E. A.: **O kinematike mestnykh vetrov Alazanskoĭ doliny,** [Kinematics of local winds in the Alazan Valley], p. 169–173

Ozmidov, R. V.: **Diffuziia primesi v pole odnorodnoĭ izotropnoĭ turbulentnosti,** [Diffusion of impurities in a homogeneous isotropic turbulence field], p. 174–175

Alma-Ata, Kazakhstan. Kazakhskiĭ Nauchno-Issledovatel'skiĭ Gidrometeorologicheskiĭ Institut, Trudy, No. 10, 1959. (Duletova, T. A., ed., Voprosy sinopticheskoĭ meteorologii [Problems of synoptic meteorology])

Golubov, R. S.: **Ispol'zovanie dannykh zondirovaniia atmosfery pri sostavlenii prognoza dozhdeĭ,** [Use of atmospheric sounding data for forecasting rain], p. 3–24

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Baĭdal, M. Kh.: **Epokhal'nye osobennosti atmosfernoĭ tsirkuliatsii i sviazannye s nimi iavleniia,** [Epochal characteristics of atmospheric circulation and associated phenomena], p. 73–81

Duletova, T. A. and Grebeniuk, E. V.: **Karty razmeshcheniia vysokikh kholodnykh tsiklonov i vysokikh teplykh antitsiklonov v kontse estestvennogo sinopticheskogo perioda,** [Charts of the distribution of high level cold cyclones and high level warm anticyclones at the end of a natural synoptic period], p. 82–87

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Grebeniuk, E. V. and Duletova, T. A.: **Sinopticheskie usloviia vozniknoveniia obil'nykh snegopadov v Kazakhstane,** [Synoptic conditions for the formation of heavy snowfall in Kazakhstan], p. 92–103

Golubov, R. S.: **Sinoptiko-klimaticheskoe opisanie obil'nykh livneĭ v raĭone Alma-Aty,** [Synoptic-climatic description of heavy showers in the Alma-Ata area], p. 104–117

American Meteorological Society, Bulletin, Vol. 41, No. 5, May 1960

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Hentschel, G.: **Methodische Vorschläge und Bewertungshinweise für die lufthygienische Praxis,** [Methodological recommendations and suggestions on evaluation in air sanitation practice], p. 257–263
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